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CORRECTIVE MEASURES STUDY FOR SOLID WASTE MANAGEMENT UNIT 13 NS MAYPORT FL
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TETRA TECH NUS

Corrective Measures Study
for
Solid Waste Management Unit 13

Naval Station Mayport
Mayport, Florida

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0245

November 2004

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CORRECTIVE MEASURES STUDY
FOR
SOLID WASTE MANAGEMENT UNIT 13

NAVAL STATION MAYPORT
MAYPORT, FLORIDA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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This document identified as *Corrective Measures Study for Solid Waste Management Unit 13, Naval Station Mayport, Mayport, Florida*, has been prepared under the direction of a Florida Registered Professional Engineer. The work and professional opinions rendered in this report were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document was prepared for Naval Station Mayport, Mayport, Florida, and should not be construed to apply to any other site.

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FOREWORD

To meet its mission objectives, the United States Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense initiated various programs to investigate and remediate conditions related to suspect past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). The acts, passed by Congress in 1980 and 1986, respectively, established the means to assess and cleanup hazardous waste sites for both private-sector and federal facilities. These acts are the basis for what is commonly known as the Superfund Program.

Originally, the Navy's part of this program was called the Navy Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adapted the program structure and terminology of the standard IR program.

The IR program is conducted in several stages as follows.

- The preliminary assessment (PA) identifies potential sites through record searches and interviews.

- A site inspection (SI) then confirms which areas contain contamination, constituting actual "sites". (Together, the PA and SI steps were called the Initial Assessment Study under the NACIP program.)

- Next, the Remedial Investigation and the Feasibility Study (RI/FS) together determine the type and extent of contamination, establish criteria for cleanup, and identify and evaluate any necessary remedial action alternatives and their costs. As part of the RI/FS, a risk assessment identifies potential effects on human health or the environment to help evaluate remedial action alternatives.

- The selected alternative is planned and conducted in the remedial design and remedial action stages. Monitoring then ensures the effectiveness of the effort.

A second program to address present hazardous material management is the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. This program is designed to identify and cleanup releases of hazardous substances at RCRA-permitted facilities. RCRA ensures that solid and hazardous wastes are managed in an environmentally sound manner. The law applies primarily to facilities that generate or handle hazardous waste.

The RCRA program is conducted in the following three stages.

1. The RCRA facility assessment identifies solid waste management units (SWMUs), evaluates the potential for releases of contaminants, and determines the need for future investigations.
2. The RCRA facility (RFI) investigation then determines the nature, extent, and fate of contaminant releases.
3. The Corrective Measures Study (CMS) identifies and recommends measures to correct the release.

The hazardous waste investigations at Naval Station (NAVSTA) Mayport are presently being conducted under the RCRA Corrective Action Program. Preliminary investigations had been conducted earlier at NAVSTA Mayport under the Navy's NACIP program and IR Program following Superfund guidelines. In 1988, in coordination with the United States Environmental Protection Agency (USEPA) and the Florida Department of Environmental Regulation, now known as the Florida Department of Environmental Protection (FDEP), the hazardous waste investigations were formalized under the RCRA Program.

Mayport is conducting the cleanup at their facility by working through the Southern Division, Naval Facilities Engineering Command (NAVFAC EFD SOUTH). The USEPA and the FDEP oversee the Navy environmental program. All aspects of the program are conducted in compliance with state and federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the RCRA program at NAVSTA Mayport should be addressed to Ms. Cheryl Mitchell (Code N4E), (904) 270-6730, extension 201.

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ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
AOC	Area of concern
ARAR	Applicable or relevant and appropriate requirement
bgs	Below ground surface
BSV	Background screening value
CAMP	Corrective Action Management Plan
CAO	Corrective Action Objective
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action Navy
CMS	Corrective Measures Study
COC	Contaminant of concern
COI	Contaminant of interest
COPC	Contaminant of potential concern
CTL	Cleanup target level
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlordiphenyldichloroethylene
ELCR	Excess lifetime cancer risk
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
GCTL	Groundwater cleanup target level
GIR	General Information Report
HI	Hazard Index
HQ	Hazard Quotient
HSWA	Hazardous and Solid Waste Amendments
IAS	Initial Assessment Study
IR	Installation Restoration
MCL	Maximum Contaminant Level
MCS	Media Cleanup Standards
Meq	Milliequivalents
mg/kg	Milligrams per kilogram
mg/kg/day	Milligrams per kilogram per day
NACIP	Navy Assessment and Control of Installation Pollutants
NAVSTA	U.S. Naval Station
NAVFAC EFD SOUTH	Southern Division, Naval Facilities Engineering Command
NFA	No Further Action
NIRP	Navy Installation Restoration Program
PA	Preliminary Assessment
PCB	Polychlorinated biphenyl
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act

ACRONYMS (CONTINUED)

RFA	RCRA Facility Assessment
RfD	Reference dose
RFI	RCRA Facility Investigation
RGO	Remedial Goal Options
RI/FS	Remedial Investigation and Feasibility Study
SARA	Superfund Amendments and Reauthorization Act
SCTL	Soil cleanup target level
SI	Site inspection
SOP	Standard Operating Procedure
SVOC	Semivolatile organic compound
SWMU	Solid Waste Management Unit
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbon
TtNUS	Tetra Tech NUS, Inc.
UCL	Upper confidence limit
µg/L	Micrograms per liter
USEPA	United States Environmental Protection Agency
USCS	United Soil Classification System
USGS	United States Geological Survey
VOC	Volatile organic compound
VSI	Visual site inspection

EXECUTIVE SUMMARY

A Corrective Measures Study (CMS) has been conducted for Solid Waste Management Unit (SWMU) 13 at Naval Station (NAVSTA) Mayport in Mayport, Florida, by the Southern Division, Naval Facilities Engineering Command (NAVFAC EFD SOUTH), pursuant to the Resource Conservation and Recovery Act (RCRA). This CMS was conducted in accordance with the Hazardous and Solid Waste Amendments (HSWA) permit FL9 170 024 260, issued by the United States Environmental Protection Agency (USEPA) on March 25, 1988, and revised and reissued on June 15, 1993. The HSWA/RCRA program is designed to identify and cleanup releases of hazardous substances at RCRA-permitted facilities. RCRA ensures that solid and hazardous wastes are managed in an environmentally sound manner. The law applies primarily to facilities that generate or handle hazardous waste.

The RCRA program is conducted in the following three stages.

1. The RCRA Facility Assessment (RFA) identifies SWMUs, evaluates the potential for releases of contaminants, and determines the need for future investigations.
2. The RCRA Facility Investigation (RFI) then determines the nature, extent, and fate of contaminant releases.
3. The CMS identifies and recommends measures to correct the releases.

The Final RFI report for SWMU 13 was issued in March 1996. This report presents the results of the CMS, including the following:

- Determination of the Media Cleanup Standards (MCS) using the recently approved regulation Chapter 62-777, Florida Administrative Code (FAC).
- Selection of Contaminants of Concern (COCs).
- Determination of areas and volumes of impacted media exceeding the MCS.
- Development, screening, and evaluation of corrective measure alternatives.
- Recommendation of corrective action to address the contaminated media.

This CMS report contains the results of the identification, screening, and evaluation of corrective measure alternatives for all media at SWMU 13.

SWMU 13, Old Firefighting Training Area

SWMU 13, the Old Firefighting Training Area, consisted of three distinct areas used for firefighting training exercises between 1972 and 1983. These areas are currently located around or near Building 1552 in the northeastern part of NAVSTA Mayport. Each of the three firefighting training areas consisted of earthen berms constructed on top of an abandoned asphalt runway. The berms were partially filled with two-thirds water and one-third flammable materials [aviation fuels (90 to 95 percent), waste oil, solvents, paint thinner, transformer oil, and hydraulic oil] during training exercises and ignited. Liquids not consumed in the fire were left in the berm and either infiltrated, evaporated, or allowed to drain off the sides of the pit toward the runway. These areas were disturbed during the construction of Building 1552 and 1553 and a pipeline installation. The SWMU 13 area is currently covered by the above mentioned buildings and paved or concrete parking areas.

Soil

No surface or subsurface soil COCs were identified for SWMU 13.

Groundwater

No groundwater COCs were identified for SWMU 13.

Conclusion

A comparison of the contaminants of interest (COIs) in surface soil, subsurface soil, and groundwater to residential standards was performed in this evaluation. The evaluation showed that secondary contaminants iron and manganese were present in the groundwater in excess of residential standards. However, they were detected in both an up-gradient and cross-gradient well of SWMU 13. Iron and manganese are not believed to have been associated with the former firefighting training exercises performed at this site. Therefore, corrective action is not required for SWMU 13 and No Further Action (NFA) is recommended for addressing the soil and groundwater at SWMU 13.

1.0 INTRODUCTION

A CMS has been conducted for SWMU 13 at NAVSTA Mayport, in Mayport, Florida, by the NAVFAC EFD SOUTH, pursuant to the RCRA. Tetra Tech NUS, Inc. (TtNUS) has been contracted by NAVFAC EFD SOUTH to complete this CMS under the Comprehensive Long-term Environmental Action Navy (CLEAN) III Contract Number N62467-94-D-0888. This report presents the results of the CMS, including:

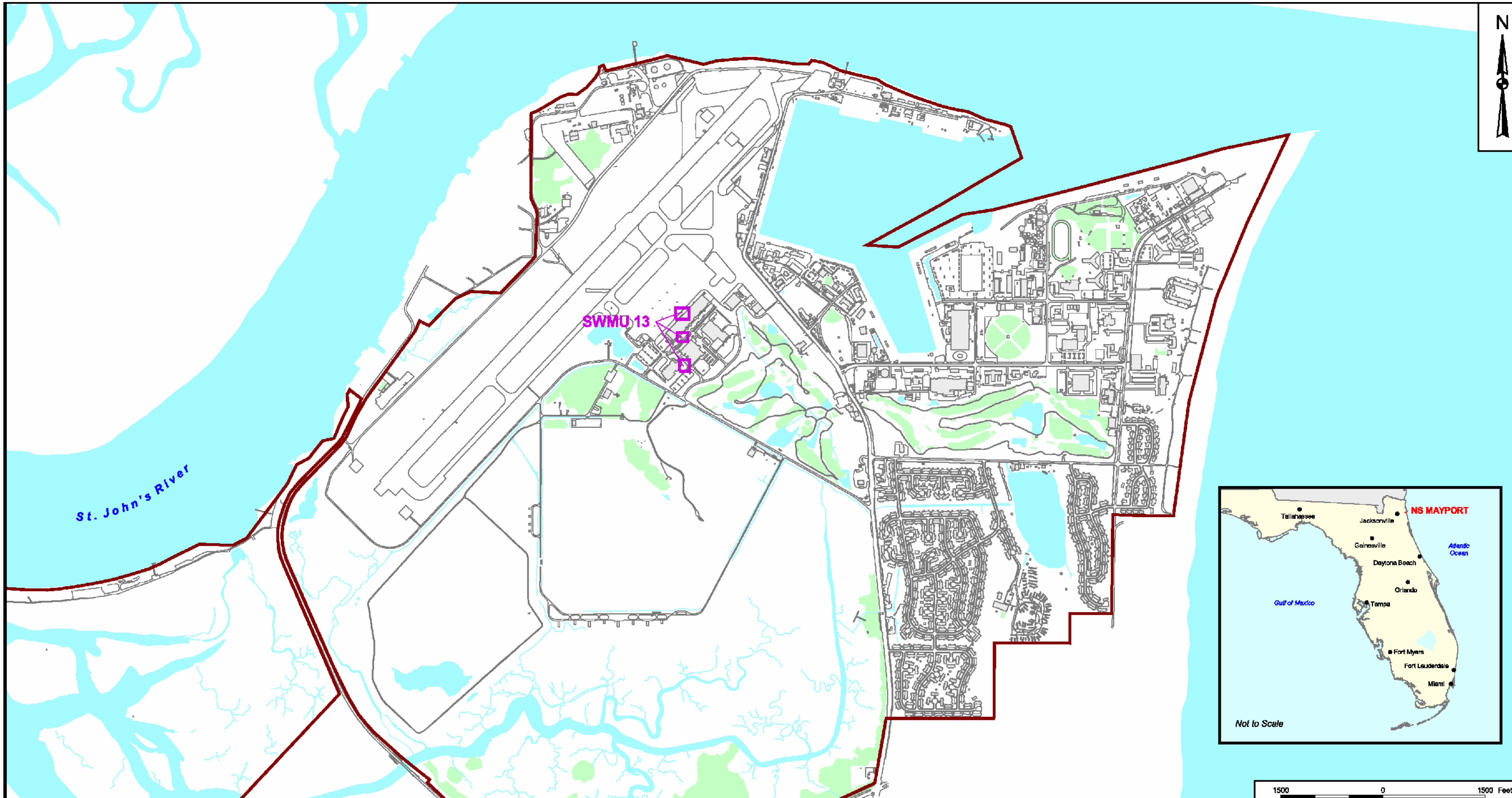
- Determination of the MCS as specified in Chapter 62-777, FAC.
- Selection of COCs.
- Determination of areas and volumes of impacted media exceeding the MCS.
- Development, screening, and evaluation of corrective measure alternatives.
- Recommendation of corrective action to address contaminated media at SWMU 13.

1.1 FACILITY DESCRIPTION

NAVSTA Mayport is located near the town of Mayport within the city limits of Jacksonville, Florida, in northeastern Duval County on the south shore of the confluence of the St. Johns River and the Atlantic Ocean (Figure 1-1).

An RFA/Visual Site Inspection (VSI) for NAVSTA Mayport was conducted for the USEPA Region IV in 1989 (Kearny, 1989). The RFA/VSI identified 56 SWMUs and 2 Areas of Concern (AOCs) at NAVSTA Mayport. These SWMUs and AOCs were included in the HSWA permit. Fifteen (15) of these SWMUs were determined to require NFA. Twenty-three (23) of the remaining SWMUs and the two (2) AOCs were determined to require further investigation by conducting RFA sampling visits, referred to in the current HSWA permit as confirmatory sampling. The remaining 18 SWMUs, including SWMU 13, were determined to require an RFI.

Because of the number of SWMUs, the diversity of their past and present operations, and the magnitude of the permit requirements, the USEPA recommended that a phased approach be used to implement the RFI and other corrective action activities at NAVSTA Mayport. A Corrective Action Management Plan (CAMP) describing the strategy used to implement the RCRA Corrective Action Program at NAVSTA Mayport [ABB-ES (ABB Environmental Services, Inc.), 1995a] was prepared in response to the USEPA recommendation.



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY A. JANOCHA DATE 5/24/04

CHECKED BY C. METZ DATE 5/24/04

COST/SCHED-AREA

SCALE AS NOTED

SITE VICINITY MAP
SWMU 13
NAVAL STATION MAYPORT
MAYPORT, FLORIDA

CONTRACT NO. N4231

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The Corrective Action Program at NAVSTA Mayport, described in the CAMP, invoked a phased approach to assure collection of adequate site characterization data to support the selection of effective corrective measures. The structure of the Corrective Action Program at NAVSTA Mayport is based on the establishment of four SWMU groups: Groups I, II, III, and IV based on the past use of the SWMU. The corrective action activities at each SWMU group are being implemented in phases.

This CMS report is for SWMU 13 at NAVSTA Mayport. Two RFI reports were written for the Group I SWMUs, which SWMU 13 is a part. The general location of SWMU 13 at NAVSTA Mayport is provided on Figure 1-1. The RFI reports for Group I SWMUs (ABB-ES, 1992 and 1996, respectively) contain pertinent information about the site background, environmental setting, nature and extent of contamination, the identification of RFI contaminants of potential concern (COPCs), seasonal or updated concentrations of contaminants in environmental media, and the results of remedial measures that have reduced or eliminated risks or exposure pathways between certain media and potential receptors for SWMU 13. A letter report, dated May 2, 2003, was written to document the confirmatory groundwater sampling activities conducted in 2002 and 2003 (TtNUS, 2003). The confirmatory groundwater sampling was performed to confirm the groundwater analysis results submitted in the RFI reports.

Information has been taken from all of the above reports to describe the current conditions at SWMU 13 and is presented in Section 2.0 of this CMS.

1.2 DOCUMENT ORGANIZATION

This CMS report contains a summary of the RFI and confirmatory groundwater sampling findings relevant to the CMS; identification of the contaminants and media that present unacceptable risk(s) to human and ecological receptors; evaluation of corrective measures alternatives and recommendation of a preferred alternative for addressing the risks. This information is presented in two sections that describe SWMU 13. Section 1.0 includes a general facility description, identifies the primary sources of information, describes the physical and environmental setting of SWMU 13, and presents the general methodology used in the CMS to identify contaminants and media of concern. Section 2.0 describes the current conditions for SWMU 13, presents the evaluation and selection of COPCs and COCs, identifies and evaluates corrective measures alternatives, and selects the recommended alternative for soil and groundwater at SWMU 13. Appendix A contains historical figures. Appendix B contains the CMS Data Set for SWMU 13. Appendix C contains the representative concentration calculations used in selecting COCs.

1.3 PHYSICAL CHARACTERISTICS OF SWMU 13

A detailed description of the physical characteristics of NAVSTA Mayport, including topography, demography, climate, soil types, and regional hydrogeology has been presented in Sections 1.0 and 3.0 of the NAVSTA Mayport General Information Report (GIR) (ABB-ES, 1995b). The following sections also provide summaries of the geologic and hydrologic data collected at the Group I SWMUs (ABB-ES, 1996), particularly SWMU 13.

1.3.1 <u>Soils and Geology</u>

In the area where SWMU 13 is located, dredge material overlies undifferentiated post-Hawthorn deposits to depths of approximately 8 to 12 feet below ground surface (bgs). The thickness of the dredge material is a result of variations in the original topographic contour of the near-shore environments in which the dredge material was placed. The dredge material consists predominantly of fine-grained, well-sorted sands that may include marine shell fragments. Underlying the dredge materials are sediments that comprise the undifferentiated post-Hawthorn deposits. These sediments primarily consist of fairly uniform, well-sorted, fine-grained sand with a Unified Soil Classification System designation of SP. However, the undifferentiated deposits (CH or MH visual classification) frequently include a very soft gray to dark gray silty clay layer that is typically 4 feet thick and likely represents recent estuarine deposition. This layer appears to be restricted to more landward, lower-energy depositional zones and is not found in former high-energy beach or river channel deposits. The undifferentiated post-Hawthorn deposits are likely the product of Miocene to Holocene fluvial and marine deposition and the erosion and redeposition of Hawthorn Group sediments. The top of the Upper Hawthorn deposits was estimated to be at a depth of approximately 75 feet bgs in the Group I area. Lithologically, the Hawthorn Group is variable and consists of calcareous, phosphatic sandy clays and clayey sands interbedded with thin discontinuous lenses of phosphatic sand, sandy limestone, limestone, and dolostone. The contact between the Hawthorn and the overlying undifferentiated Miocene and younger deposits is marked by an unconformity expressed by a coarse phosphatic sand and a gravel bed.

Shallow soil in the SWMU 13 area typically consists of fine- to medium-grained sand or silty sand that may have shell fragments in the matrix. This sand was interpreted to be dredge material in the RFI. Beneath the dredge material is a light to dark gray to green to brown clay layer typically found around 10 to 11 feet bgs. The clay may be up to 10 feet thick but is typically about 4 feet in thickness. Two deep borings completed in the Group I SWMU area showed sand beneath the shallow clay layer and another interval of clay between 40 and 50 feet bgs followed by sand to the boring terminus depths of 100 to 125 feet bgs. Both borings terminated in another clay interval.

1.3.2 Hydrogeology

Three primary aquifer systems are recognized beneath NAVSTA Mayport (in descending order): the surficial aquifer, the Intermediate Hawthorn Aquifer, and the Floridan aquifer system. The surficial aquifer, which extends from near the surface to a depth of nearly 100 feet bgs at NAVSTA Mayport, is the first aquifer beneath SWMU 13 and is the groundwater zone considered in this CMS. It includes all of the undifferentiated post-Hawthorn deposits (see Section 1.3.1) and consists of unconsolidated sand, shell, and clay, which vary horizontally and vertically in lithology, thickness, and permeability. It is recharged primarily by precipitation at a countywide estimated rate of 51.4 inches per year. Discharge in the vicinity of NAVSTA Mayport is primarily by seepage into surface water bodies and evapotranspiration. At SWMU 13, the direction of groundwater flow is nearly radial due to a mound that projects south from the runway to this area. It has also been reported that groundwater becomes brackish below a depth of 40 feet at NAVSTA Mayport.

The surficial aquifer is underlain by the Hawthorn Group. The Hawthorn Group consists of sand and limestone layers interbedded with clayey sand and sandy clay and is sometimes referred to as the “intermediate artesian aquifer” due to the presence of interbedded discontinuous water bearing strata. It was noted in the RFI that the most productive limestone layer in the upper part of the Hawthorn Aquifer is absent in the Mayport area. Thus, the Intermediate Hawthorn Aquifer may be in hydraulic contact with the surficial aquifer at NAVSTA Mayport. Overall, the Hawthorn Group is a complex aquiclude that acts as a confining unit between the surficial aquifer and the underlying Floridan aquifer. The primary recharge mechanism for the water-bearing zones of the Hawthorn Group is precipitation in areas approximately 30 miles to the west of NAVSTA Mayport where the Hawthorn Group sediments occur at shallow depths. Because the surficial aquifer is the preferred pathway for groundwater flow and contaminant migration at NAVSTA Mayport, groundwater in the Hawthorn Group and the Floridan aquifer were not considered in the CMS.

The general hydrogeology of SWMU 13 was described in the GIR (ABB-ES, 1995b). A station-wide tidal study was performed, water levels were measured, the potentiometric surface was mapped at different points in time, aquifer conductivity testing was conducted, and aquifer material physical properties were tested. The site-specific hydrogeology of SWMU 13 was investigated during the RFI. Additional water level studies were completed in the deposition of a large volume of water and sediment slurry in the constructed Dredge Material Holding Areas, SWMU 50, located immediately south of SWMU 13. This information was presented in the RFI Report for Group I SWMUs and is included in the hydrogeologic summary presented below for SWMU 13.

1.3.2.1 Hydrologic Characteristics of SWMU 13

- Wells MPT-2-MW12S and MPT-2-MW-12I, located south of SWMU 13 along the southern corner of SWMU 5, were included in the tidal effects study; groundwater level amplitudes of 0.3 and 0.2 feet, respectively, were observed for the two wells between high and low tide. A time lag of approximately 7.5 to 11 hours relative to the tidal fluctuation was observed for the two wells. The study concluded that tidal effects were only likely to occur in wells located adjacent to tidally influenced water bodies, such as the portions of the ditches around the Group I SWMUs that are influenced by Sherman Creek.

- A hydrologic mound (i.e., area of recharge) controls the direction of groundwater flow in the vicinity of the SWMU 13. The direction of groundwater flow was generally outward from this mound. Discharge occurred to tidally influenced ditches located around the perimeters of the Group I SWMUs and along Patrol Road and estuarine marsh areas located to the south of the Group I SWMUs along Sherman Creek.

- Groundwater horizontal gradients in the vicinity of SWMU 13 ranged from 0.006 to 0.023 feet per foot; downward gradients near this SWMU ranged from 0.081 to 0.11 feet per foot, and an upward gradient of -0.035 feet per foot. Considerable variation in the groundwater gradient was observed across the Group I SWMU area and vertical gradients were observed to be greater than horizontal gradients.

- The range of radial hydraulic conductivity values for wells screened in the shallow zone of the surficial aquifer near SWMU 13 was 1.3 to 18.1 feet/day, with an average of 16.6 feet/day. No wells near SWMU 13 have been screened in the intermediate or deep monitoring zones in the surficial aquifer. Review of available data indicated that in situ radial hydraulic conductivity values appear to decrease with depth. The vertical hydraulic conductivity values for the intermediate and deep aquifer zone samples were, in general, orders of magnitude lower than the horizontal in situ hydraulic conductivity values.

- The groundwater flow velocity was estimated to range from approximately 0.07 feet/day (26 feet/year) to 0.25 feet/day (91 feet/year). These high flow velocities, compared to most other areas at NAVSTA Mayport, are a result of the relatively high groundwater gradients due in part to the groundwater mounds created by the deposition of dredge material slurry in SWMU 50 during the RFI. The RFI concluded that flow rates reported in the GIR [i.e., 0.07 to 0.22 feet/day (27 to 80 feet/year)] are more likely representative of conditions when dredging and slurry deposition are not being conducted.

- Testing of soil samples near SWMU 13 showed the following results: pH equal to 8.19 to 9.11; cation exchange capacity less than or equal 0.7 to 1.8 milliequivalents (Meq)/100 grams; moisture equal to 14.9 to 15.4 percent; and total organic carbon (TOC) content equal to 1320 to 2470 milligrams per kilogram (mg/kg).

1.3.3 Background Conditions

Background screening values (BSVs) were originally calculated and presented in the RCRA GIR for NAVSTA Mayport, Florida (ABB-ES, 1995b). The calculations were based on analytical results for samples from each medium of concern including groundwater, surface soil, subsurface soil, sediment, and surface water. During a subsequent review of the background data, it was determined that certain procedures used during the original background calculations were not consistent with current regulatory guidelines. A recalculation of the background screening values was performed primarily to conform with newer regulatory guidance. The revised background values were presented in an August 17, 2000 report (*Recalculation of Media Background Screening Values NAVSTA Mayport, FL*) by TtNUS.

It was noted during this review of the background data sets that many of the results for each medium sampled were less than the laboratory method detection limits. Consequently, the use of one-half the detection limit for results less than the analytical detection limit in the recalculation methodology may result in a reduced mean concentration. In the recalculation, the background screening concentration was compared with the maximum background concentration in each medium's data set. If the screening concentration (i.e., two times the mean of the background data set) for a contaminant was less than the maximum concentration for that contaminant, then the background screening concentration for that contaminant was bolded and footnoted. For these contaminants, if a detection occurred in site media within the range of concentration between the screening concentration and the maximum concentration, then these contaminants received additional evaluation on a case by case basis to determine if the detection represents the upper range of background or a release. Tables 1-1 through 1-3 present the re-calculated background screening values for surface and subsurface soil and groundwater at NAVSTA Mayport.

TABLE 1-1

STATISTICS AND BACKGROUND SCREENING CONCENTRATIONS – SURFACE SOIL
SWMU 13
NAVSTA MAYPORT, FLORIDA

Chemical	Frequency of Detection [1]	Range of Reporting Limits [2]	Range of Detected Concentrations [2]	Arithmetic Mean [3]	BG Screen [4]
Inorganics (mg/kg)					
Antimony	0 / 6	5.2 -- 6	-- [5]	ND [5]	ND [5]
Arsenic	0 / 6	0.76 -- 2.6	-- [5]	ND [5]	ND [5]
Barium	6 / 6	-- [6]	0.76 -- 5	2.75	5.50
Beryllium	1 / 6	0.06 -- 0.07	0.09	0.05	0.09
Cadmium	1 / 6	0.83 -- 0.96	1 -- 1	0.5	1.1
Chromium	6 / 6	-- [6]	0.68 -- 2.5	1.3	2.6
Cobalt	0 / 6	0.47 -- 0.55	-- [5]	ND [5]	ND [5]
Copper	1 / 6	0.35 -- 0.41	2.1	0.35	**0.69** [7]
Cyanide	0 / 6	0.16 -- 0.18	-- [5]	ND [5]	ND [5]
Lead	0 / 6	0.25 -- 1.7	-- [5]	ND [5]	ND [5]
Mercury	0 / 6	0.03 -- 0.07	-- [5]	ND [5]	ND [5]
Nickel	0 / 6	2.6 -- 3	-- [5]	ND [5]	ND [5]
Selenium	5 / 6	0.45 -- 0.45	0.47 -- 0.86	0.6	1.2
Silver	0 / 6	0.51 -- 0.59	-- [5]	ND [5]	ND [5]
Thallium	4 / 6	0.53 -- 0.62	0.77 -- 1.1	0.7	1.4
Tin	0 / 6	7.3 -- 8.5	-- [5]	ND [5]	ND [5]
Vanadium	5 / 6	0.46 -- 0.46	1.2 -- 2.5	1.7	3.4
Zinc	6 / 6	-- [6]	0.35 -- 1.9	1.3	2.7
Miscellaneous Parameters (mg/kg)					
Total Organic Carbon	6 / 6	-- [6]	1,440 -- 8,030	3,499	**6,998** [7]

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed (excluding rejected results); duplicates included but not counted.
2 Ranges include duplicate and/or re-sample results, where appropriate.
3 The mean includes detected concentrations and one-half the laboratory reporting limit for non-detect (ND) results; duplicate samples and re-sample results were averaged prior to calculation of the mean.
4 Background (BG) Screen is twice the arithmetic mean of the data.
5 All results were non-detects (ND); mean and BG screening value not applicable.
6 All results were positive detects.
7 Bold BG Screen result indicates that value is less than maximum concentration of that chemical.

TABLE 1-2

**STATISTICS AND BACKGROUND SCREENING CONCENTRATIONS – SUBSURFACE SOIL
SWMU 13
NAVSTA MAYPORT, FLORIDA**

Chemical	Frequency of Detection [1]	Range of Reporting Limits [2]	Range of Detected Concentrations [2]	Arithmetic Mean [3]	BG Screen [4]
Inorganics (mg/kg)					
Antimony	0 / 4	1.1 -- 1.2	-- [5]	ND [5]	ND [5]
Arsenic	3 / 4	0.13 -- 0.13	0.33 -- 0.58	0.35	0.70
Barium	4 / 4	-- [6]	1.9 -- 6.8	3.6	7.2
Beryllium	1 / 4	0.07 -- 0.07	0.07	0.04	0.09
Cadmium	0 / 4	0.22 -- 0.23	-- [5]	ND [5]	ND [5]
Chromium	3 / 4	0.57 -- 0.57	1.4 -- 3	1.4	2.7
Cobalt	1 / 4	0.67 -- 0.72	0.71	0.4	0.8
Copper	2 / 4	0.2 -- 0.9	1.4 -- 2.3	1.0	**2.1** [7]
Cyanide	1 / 4	0.15 -- 0.16	0.58	0.1	**0.3** [7]
Lead	2 / 4	0.58 -- 0.59	0.75 -- 1.9	0.83	**1.66** [7]
Mercury	3 / 4	0.03 -- 0.03	0.03 -- 0.03	0.02	0.05
Nickel	0 / 4	1.3 -- 1.4	-- [5]	ND [5]	ND [5]
Selenium	0 / 4	0.13 -- 0.14	-- [5]	ND [5]	ND [5]
Silver	0 / 4	0.45 -- 0.49	-- [5]	ND [5]	ND [5]
Thallium	0 / 4	0.13 -- 0.14	-- [5]	ND [5]	ND [5]
Tin	4 / 4	-- [6]	2.2 -- 4	2.7	5.4
Vanadium	4 / 4	-- [6]	0.71 -- 2.5	1.6	3.1
Zinc	4 / 4	-- [6]	2 -- 2.9	2.4	4.9

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed (excluding rejected results); duplicates included but not counted.
2 Ranges include duplicate and/or re-sample results, where appropriate.
3 The mean includes detected concentrations and one-half the laboratory reporting limit for non-detect (ND) results; duplicate samples and re-sample results were averaged prior to calculation of the mean.
4 Background (BG) Screen is twice the arithmetic mean of the data.
5 All results were non-detects (ND); mean and BG screening value not applicable.
6 All results were positive detects.
7 Bold BG Screen result indicates that value is less than maximum concentration of that chemical.

TABLE 1-3

STATISTICS AND BACKGROUND SCREENING CONCENTRATIONS – GROUNDWATER
SWMU 13
NAVSTA MAYPORT, FLORIDA

Chemical	Frequency of Detection [1]	Range of Reporting Limits [2]	Range of Detected Concentrations [2]	Arithmetic Mean [3]	BG Screen [4]
Inorganics (μg/L)					
Arsenic	5 / 8	0.6 -- 6	0.6 -- 6	2.6	**5.3** [5]
Antimony	0 / 8	2.2 -- 50	-- [6]	ND [6]	ND [6]
Barium	5 / 8	1.2 -- 3.3	6.4 -- 75.5	18.9	**37.8** [5]
Beryllium	0 / 8	0.18 -- 0.3	-- [6]	ND [6]	ND [6]
Cadmium	0 / 8	1 -- 3	-- [6]	ND [6]	ND [6]
Calcium	8 / 8	-- [7]	65,000 -- 251,000	113,063	**226,125** [5]
Chromium	0 / 8	2 -- 2.6	-- [6]	ND [6]	ND [6]
Cobalt	0 / 8	2.7 -- 3.1	-- [6]	ND [6]	ND [6]
Copper	0 / 8	0.9 -- 12.7	-- [6]	ND [6]	ND [6]
Cyanide	1 / 8	0.81 -- 2.7	0.95	1	2
Iron	6 / 8	68.2 -- 78.6	15.4 -- 660	247	**494** [5]
Lead	1 / 8	0.6 -- 6	1.5	1	2
Magnesium	6 / 8	18,800 -- 19,700	28,60 -- 419,000	92,196	**184,393** [5]
Manganese	6 / 8	20.1 -- 23.6	7.1 -- 228	70	**141** [5]
Mercury	2 / 8	0.08 -- 0.5	0.08 -- 0.1	0.08	0.16
Nickel	0 / 8	5.9 -- 7.3	-- [6]	ND [6]	ND [6]
Selenium	0 / 6	0.6 -- 13.2	-- [6]	ND [6]	ND [6]
Silver	0 / 8	2.1 -- 2.3	-- [6]	ND [6]	ND [6]
Sodium	6 / 8	31,500 -- 39,500	9,300 -- 3,310,000	762,294	**1,524,588** [5]
Thallium	0 / 8	0.6 -- 6	-- [6]	ND [6]	ND [6]
Tin	0 / 8	8 -- 9.4	-- [6]	ND [6]	ND [6]
Vanadium	6 / 8	1.5 -- 1.7	2.3 -- 5.8	3	6
Zinc	1 / 8	1.82 -- 8.8	4.3	2.9	5.8
Miscellaneous Parameters (mg/L)					
Ammonia, as nitrogen	3 / 3	-- [7]	0.7 -- 1.3	1.0	2.1
Chloride	6 / 6	-- [7]	15 -- 6,600	1,142	**2,284** [5]
Sulfate	6 / 6	-- [7]	36.4 -- 1,230	257	514
Total dissolved solids	6 / 6	-- [7]	417 -- 8,150	1,881	3,762

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed (excluding rejected results); duplicates included but not counted.
2 Ranges include duplicate and/or re-sample results, where appropriate.
3 The mean includes detected concentrations and one-half the laboratory reporting limit for non-detect (ND) results; duplicate samples and re-sample results were averaged prior to calculation of the mean.
4 Background (BG) Screen is twice the arithmetic mean of the data.
5 Bold BG Screen result indicates that value is less than maximum concentration of that chemical.
6 All results were non-detects (ND); mean and BG screening value not applicable.
7 All results were positive detects.

1.3.4 Corrective Measures Study Methodology

This CMS for SWMU 13 uses the CMS process described in the CMS Work Plan (ABB-ES, 1995c) for NAVSTA Mayport with the incorporation of the newer USEPA guidance for conducting a CMS (USEPA, 1994). The purpose of the CMS is to identify, evaluate, and recommend corrective action for SWMUs that warrant such action based on the results of the RFI. Investigation data documented in the station-wide GIR, the RFI reports and subsequent confirmatory sampling reports conducted at SWMU 13 were reviewed to gain an understanding of the physical setting, past history, current conditions, and future land uses. The available, validated analytical data for the environmental media were assembled into a single CMS database. The following key components were considered in identifying appropriate corrective action.

- Corrective Action Objectives (CAOs). CAOs are developed to specify the contaminants, media of interest, exposure pathways, and corrective action goals for a SWMU.

- MCS. MCS are developed based on regulatory requirements (when available), site-specific risk-based factors, or other available information (e.g., leachability of contaminants from soil to groundwater). MCS were derived for both human and ecological receptors from information presented in the RFI report, or were developed based on the State of Florida 62-777, FAC Cleanup Target Level (CTL) criteria for each medium of concern.

- COCs. Contaminants detected in the media of concern were compared against promulgated regulatory standards or other applicable or relevant and appropriate requirements (ARARs) criteria to identify COPCs in each environmental medium for both human and ecological receptors. COCs are developed from the list of COPCs determined in the RFI Report or as updated in the CMS. COCs define the contaminants that will be evaluated for corrective action in the CMS.

- Volumes of Media of Concern. The volumes (or areas) of media of concern at each SWMU are determined by considering the requirements for protectiveness as identified in the CAOs and the chemical and physical characterization of the site (i.e., the results and conclusions of the RFI and post-RFI activities). Essentially, the area and depth of a given medium containing concentrations of COCs that exceed the MCS were used to define the volumes of media of concern.

- Applicable Technologies. Technologies applicable to contaminated media at each SWMU are identified and screened. Technologies that cannot be implemented technically are eliminated.

- Corrective Measure Alternatives. Technologies that pass the screening phase are assembled into corrective measure alternatives.

- Evaluation of Corrective Measure Alternatives. Recommended corrective measure alternatives are described and evaluated using four criteria: technical, environmental, human health, and institutional factors.

- Recommendation of Corrective Action. The results of the evaluation of alternatives are summarized and a corrective action is recommended for each SWMU.

These components are described further in the CMS Work Plan for NAVSTA Mayport (ABB-ES, 1995c). A more detailed discussion of the methodology for CAOs, MCS, COCs, and COPCs used in this CMS is provided in the following sections.

1.3.5 Corrective Action Objectives

CAOs are aimed at protecting human health and the environment and are expressed for each medium of concern. At SWMU 13, the media of concern for the CMS included surface soil, subsurface soil, and groundwater. CAOs were based on the COPCs, the exposure pathway, and the present and future receptors at each SWMU. Development of the CAOs considered the results of the RFI, particularly the human health and ecological risk assessments, as well as the applicable federal and state standards.

For this CMS, CAOs are formulated to address unacceptable human health and ecological risk that exist for direct exposure to groundwater and surface or subsurface soil based on the current and anticipated future use of the sites. The exposure scenarios for human health receptors used the Chapter 62-777, FAC CTL's criteria for residential exposure. Exposure scenarios for ecological receptors were developed in the RFI using ecological benchmarks consistent with current values applicable and relevant to the State of Florida. The current and future use of the property at SWMU 13 is anticipated to remain industrial. The current and future receptors are commercial/industrial workers; potential exposure of shoreline benthic aquatic receptors in the St. Johns River and Mayport Turning Basin and terrestrial ecological receptors were not considered pathways of concern in the RFI for this SWMU. Based on the current and future use receptors, the following CAOs were developed for SWMU 13.

Soil

CAO 1: Protect human health from carcinogenic and non-carcinogenic risks associated with incidental ingestion of, inhalation of, and dermal contact with contaminated soil or sediment in excess of the FDEP Soil Cleanup Target Levels (SCTLs) (Chapter 62-777, FAC) for residential exposure. The cumulative risk for all COCs shall not exceed an excess lifetime cancer risk (ELCR) of 1.0×10^{-6} for residential exposure to soil or sediment. The Hazard Quotient (HQ) for each contaminant shall not exceed 1.0 for residential exposure to soil or sediment. The Hazard Index (HI) (sum of the HQs) shall not exceed 1.0 for residential exposure to soil or sediment.

CAO 2: Prevent leaching of contaminants from soil that would result in groundwater concentrations that do not meet CAOs for groundwater.

CAO 3: Protect the environment from COCs in the soil that cause adverse biological effects.

Groundwater

CAO 4: Prevent ingestion of surficial aquifer groundwater containing carcinogens in excess of FDEP Groundwater Cleanup Target Levels (GCTLs) (Chapter 62-777, FAC) for groundwater criteria until CAO 3 has been met. The cumulative risk for all COCs shall not exceed an excess lifetime cancer risk (ELCR) of 1.0×10^{-6} for residential/industrial exposure to groundwater.

CAO 5: Prevent ingestion of surficial aquifer groundwater containing non-carcinogens in excess of the FDEP GCTLs (Chapter 62-777, FAC) until CAO 3 has been met. The HQ for each contaminant shall not exceed 1.0 for the residential/industrial exposure to groundwater. The HI (sum of the HQs) shall not exceed 1.0 for the residential/industrial exposure to groundwater.

CAO 6: Restore the groundwater surficial aquifer to the State of Florida GCTLs (Chapter 62-777, FAC) for groundwater criteria.

1.3.6 Media Cleanup Standards

MCS establish acceptable exposure levels that are protective of human health and the environment and were estimated for SWMU 13 using baseline assumptions and inputs. MCS are determined based on federal and state standards, contaminants and media of interest, and exposure pathways. These calculations are based on the State of Florida CTLs (Chapter 62-777, FAC), background screening values, and assumptions regarding ultimate land uses. The current and future use of SWMU 13 is for industrial purposes; therefore, the exposure pathways would be to commercial/industrial workers. However, MSC were based on residential exposure to determine if any remediation effort was warranted based on the low chemical concentrations detected. Specifically, MCS are used to determine COCs, to estimate areas and volumes of impacted media, and to set performance standards for potential remedial alternatives.

Cleanup of inorganic contaminants present at concentrations less than their established background concentrations will not be performed; therefore, background-screening values will be used as the lower limit for MCS. The MCS selection criteria are summarized below for each medium.

Soil

- The lower of the FDEP SCTLs (Chapter 62-777, FAC) for residential direct exposure or for leachability to groundwater.
- NAVSTA Mayport background screening values will be used as the lower limit for the MCS of inorganic COCs.

Groundwater

- The lower of the FDEP GCTLs (Chapter 62-777, FAC) for groundwater criteria and, when applicable, criteria for groundwater discharging into fresh or marine surface water criteria.
- NAVSTA Mayport background screening values will be used as the lower limit for the MCS of inorganic COCs.

1.3.7 Contaminants of Concern

The determination of COCs for each medium involves a three-step process:

1. Determine the COIs.
2. Identify the COPCs.
3. Select the COCs.

COIs and COPCs were determined in the RFI; however, additional data have been collected and new regulations have been promulgated since the RFI was issued. Therefore, the COIs and COPCs have been reevaluated in this document.

1.3.7.1 Contaminants of Interest

The COIs include any contaminant detected at least once in validated analytical results for environmental samples in any medium at the site during any sampling event. For this CMS, the list of COIs originally presented in the RFI was revised by including any contaminants that were detected during any environmental sampling program conducted after the RFI (e.g., confirmatory sampling). The list of COIs for SWMU 13 is presented in Section 2.0.

1.3.7.2 Contaminants of Potential Concern

The selection of COPCs was based on the list of COIs. Concentration, occurrence, and distribution of contaminants detected in the environmental media and the environmental conditions at SWMU 13 were the criteria used in the selection process. The COPC selection considered available validated soil and groundwater analytical results and included several rounds of groundwater sampling conducted after the RFI Reports were submitted.

Calcium, magnesium, potassium, and sodium were considered to be essential human nutrients and were not included in the COPC selection process.

<u>Soil</u>

The COPC selection process for soil was based on two separate evaluations: direct exposure and leachability to groundwater. The direct exposure evaluation considered initial COPCs and final COPCs. Chapter 62-777, FAC requires that the SCTLs for direct exposure be adjusted when more than one non-carcinogen that affects the same target organ or more than one carcinogen are present.

For direct exposure, the published SCTLs provided in Chapter 62-777, FAC were adjusted to account for multiple non-carcinogens present in a given medium that affected the same target organ/system and for multiple carcinogens. For these COIs, the published SCTL values were divided by the number of carcinogens or the number of non-carcinogens affecting the same target organ/system to determine an "initial target level." The maximum detected concentration for each COI was compared to the "initial target level" to determine the initial COPCs. The list of COIs was also screened to eliminate common laboratory contaminants, contaminants reported at low frequency of detection (less than 5 percent), and samples of poor quality or those which provided spurious results. Also, contaminants whose maximum concentration was less than the BSV (or under certain conditions, contaminants whose maximum concentration was within the background range) were screened out. Tables 1-1 and 1-2 present background screening values for surface soil and subsurface soil, respectively, which were developed for NAVSTA Mayport. A final direct exposure COPC determination was performed by determining the cumulative effects of the contaminants. The maximum concentration for the initial COPCs was divided by the SCTL to make a ratio. The ratios for contaminants that affect the same target organ or that are carcinogens were summed together (cumulative effect). If the sum of the ratios was less than 1, then all carcinogenic contaminants or non-carcinogenic contaminants affecting the same target organ were removed from further consideration as COPCs. If the sum of the ratios equaled or exceeded 1, then the contaminants were compared to the newly adjusted SCTLs to determine if they were retained as final COPCs.

For leachability, the maximum concentration for each COI was compared to the SCTL leachability in Chapter 62-777, FAC. The list of COIs was also screened to eliminate common laboratory contaminants, contaminants reported at low frequency of detection (less than 5 percent), and samples of poor quality or those which provided spurious results. Contaminants whose maximum concentration was less than the background screening value (or under certain conditions, contaminants whose maximum concentration was within the background range) were screened out. If the maximum concentration exceeded the leachability CTL, then the contaminant became a COPC.

Groundwater

The COPC selection process for groundwater was performed following a similar two step process that was used for soil. Contaminants that had a primary or secondary standard were handled differently than contaminants without a standard. For groundwater that discharges into a surface water feature within 300 feet, an additional evaluation was performed.

For contaminants without a primary or secondary standard, the published GCTLs provided in Chapter 62-777, FAC were adjusted to account for multiple non-carcinogens present that affected the same target organ/system and for multiple carcinogens. For the COIs without a primary or secondary standard, the published GCTL was divided by the number of carcinogens or the number of non-carcinogens affecting the same target organ/system to determine an “initial target level.” The maximum detected COI concentration was compared to the “initial target level” to determine the initial COPCs. The list of COIs was also screened to eliminate common laboratory contaminants, contaminants reported at low frequency of detection (less than 5 percent), and samples of poor quality or those which provided spurious results. Also, contaminants whose maximum concentration was less than the BSV (or under certain conditions, contaminants whose maximum concentration was within the background range) were screened out. Table 1-3 presents background screening values for groundwater that were developed for NAVSTA Mayport.

For the final COPC determination for the initial COPCs that did not have a primary or secondary standard, the maximum concentration was divided by the GCTL to form a ratio. The contaminants that affect the same target organ or that are carcinogens were summed together (cumulative effect). If the sum of the ratios was less than 1, then all carcinogenic contaminants or non-carcinogenic contaminants affecting the same target organ were removed from further consideration as COPCs. If the sum of the ratios equaled or exceeded 1, then the contaminants were compared to the newly adjusted GCTLs to determine if they were retained as final COPCs.

For contaminants with a primary or secondary standard, the maximum concentration was compared to the GCTL. The list of COIs was also screened to eliminate common laboratory contaminants, contaminants reported at low frequency of detection (less than 5 percent), and samples of poor quality or those which provided spurious results. Contaminants whose maximum concentration was less than the BSV, or under certain conditions, contaminants whose maximum concentration was within the background range, were screened out. A contaminant with a primary or secondary standard became a COPC if the maximum concentration exceeded the GCTLs listed in Chapter 62-777, FAC.

For groundwater that discharges into surface water, the maximum concentration for each COI was compared to either the Freshwater Surface Water Criteria or the Marine Surface Water Criteria table value in Chapter 62-777, FAC depending on the groundwater discharge point. The list of COIs was also screened to eliminate common laboratory contaminants, contaminants reported at low frequency of detection (less than 5 percent), and samples of poor quality or those which provided spurious results. Contaminants whose maximum concentration was less than the BSV, or under certain conditions, contaminants whose maximum concentration was within the background range, were screened out. If the maximum concentration exceeded the Freshwater Surface Water Criteria or the Marine Surface Water Criteria CTL, then the contaminant became a COPC.

1.3.7.3 Selection of Contaminants of Concern

The list of contaminants identified as COPCs may not represent a true picture of the media-specific contaminant concentrations or realistic risk exposure at a site. In order to represent overall contaminant concentration levels and exposures, COCs were developed from the list of COPCs. COCs were determined by comparing a representative concentration for each COPC to the adjusted CTL value from Chapter 62-777, FAC. In addition, the representative concentration was compared to the BSV.

The representative concentration was calculated by statistically estimating the 95 percent Upper Confidence Limit (UCL) for the data for the COPC. If a minimum of 10 samples of a given media were collected and analyzed at a site, then a calculation was performed to determine the 95 percent UCL concentration for that contaminant. A calculation page for each COPC in which a 95 percent UCL was performed is provided in Appendix C. The 95 percent UCL was then used as the site representative concentration for final comparison to the specific MCS for each medium. COPCs whose representative concentration exceeded the MCS and BSV were then selected as the COCs to be evaluated in the CMS.

The site representative concentration (maximum concentration of each COPC) was compared to the site-specific MCS for each medium. The MCS for each medium were determined by selecting the higher of the following:

- Mayport BSV.

  or

- Value calculated by dividing the published CTLs by the number of carcinogenic COPCs or the number of non-carcinogenic COPCs that affect the same target organ/system.

COPCs whose representative concentration exceeded the MCS were then selected as the COCs to be evaluated in the CMS.

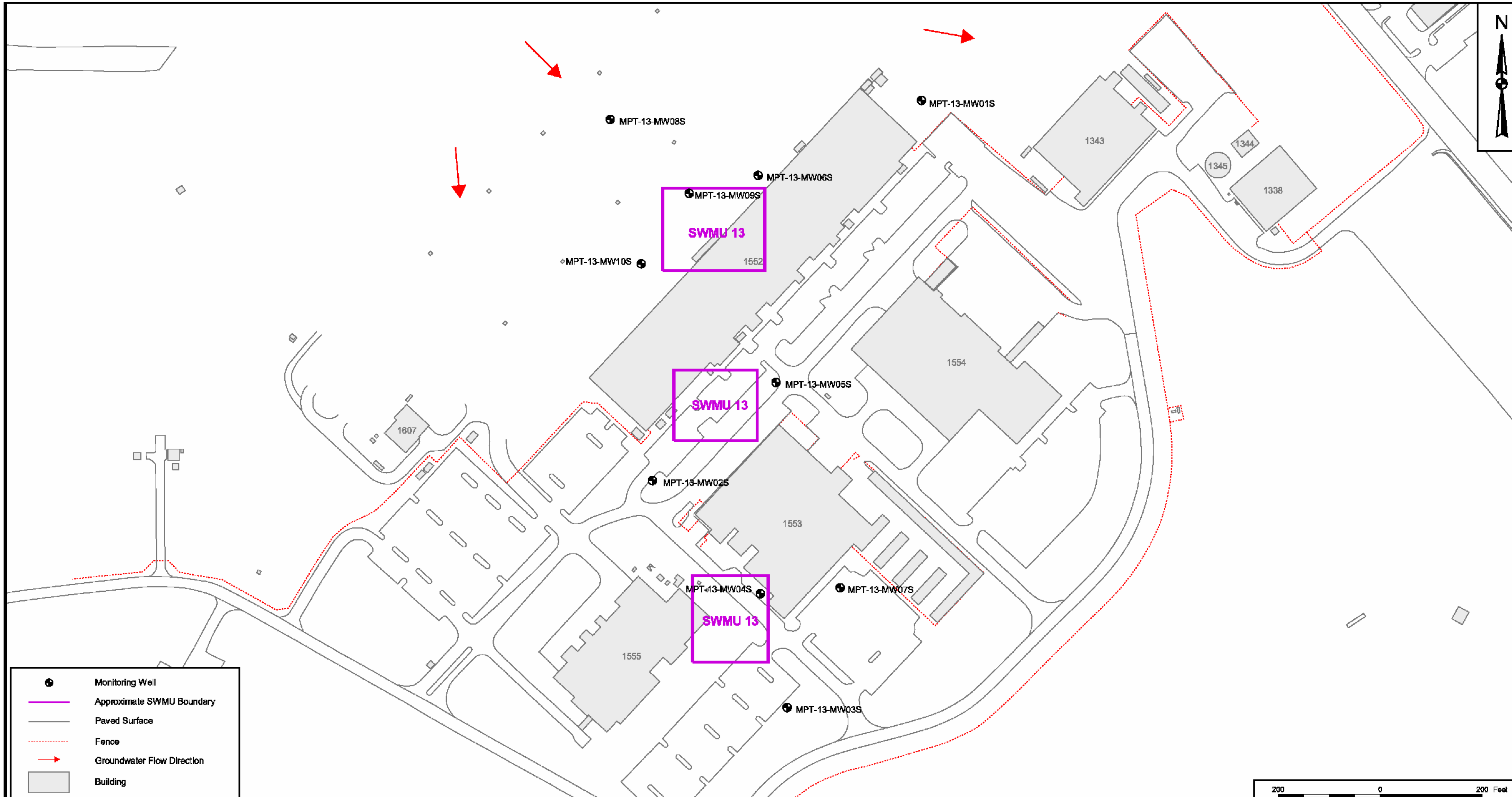
2.0 SWMU 13, OLD FIREFIGHTING TRAINING AREA

SWMU 13, the Old Firefighting Training Area, consisted of three distinct areas used for firefighting training exercises between 1972 and 1983. These areas are currently located around or near Building 1552 in the northeastern part of NAVSTA Mayport. The site location of SWMU 13 is presented on Figure 2-1.

The Navy Installation Restoration Program (NIRP) Initial Assessment Study (IAS), completed in 1986, recommended that the old firefighting training area for further investigation. The Old Firefighting Training Area was then identified as SWMU 13 in the HSWA permit for NAVSTA Mayport. Three monitoring wells were installed in 1987 at SWMU 13 during the expanded site investigation. Subsurface soil samples were collected during the well installations. Soil and groundwater samples were analyzed for priority pollutant volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and inorganics. No target analytes were detected in the subsurface soil samples. Lead [2 micrograms per liter (µg/L)] and mercury (5.3 µg/L) were detected in groundwater samples analyzed from monitoring wells MPT-13-MW03S and MPT-13-MW01S, respectively.

The RFA-VSI conducted by A. T. Kearney, Inc in 1989, for the Old Firefighting Training Area, described each of the three firefighting training areas as earthern berms constructed on top of an abandoned asphalt runway. The berms were partially filled with two-thirds water and one-third flammable material during training exercises. Flammable materials such as aviation fuel (90 to 95 percent); waste oil (5 to 10 percent); and a minor percentage of solvents (toluene and trichloroethene), paint thinner, transformer oil, and hydraulic oil were poured on the water and ignited. Liquids not consumed in the fire were left in the berm and either infiltrated, evaporated, or allowed to drain off the sides of the pit toward the runway.

Prior to 1986, the southernmost area of SWMU 13 had been disturbed during a pipeline installation. For a period of time, it was suspected that soil excavated from the pipeline may have been spread over the immediate area. The area was later paved with asphalt and is now used as a parking lot. Soil in the other two areas may have also been disturbed during the building of the Aircraft Intermediate Maintenance Depot (Building 1553), the Naval Supply Center (Building 1554), and the helicopter hangars (Building 1552); however, it was not confirmed.



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY A. JANOCHA DATE 5/24/04

CHECKED BY C. METZ DATE 6/01/04

COST/SCHED-AREA

SCALE AS NOTED

GENERAL LOCATION AND SITE FEATURES
SWMU 13
NAVAL STATION MAYPORT
MAYPORT, FLORIDA

CONTRACT NO. N4231

APPROVED BY DATE

APPROVED BY DATE

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The RFA recommended that an RFI be completed for SWMU 13. ABB-ES conducted field activities associated with the RFI from 1992 through 1994. TtNUS conducted confirmatory groundwater sampling (confirmed RFI results) in 2002 and 2003. The results of these activities are presented in Section 2.1.

2.1 DESCRIPTION OF CURRENT CONDITIONS

The description of current conditions is based on data collected by ABB-ES during site visits conducted in January 1992 and in 1994 and from confirmatory groundwater sampling conducted by TtNUS in May 2002 and March 2003. This information was taken from the Group I RFI Reports (ABB-ES, 1992 and 1996) and SWMU 13 Letter Report (TtNUS, 2003) and is summarized in the following sections. However, the Group I RFI Reports, and SWMU 13 Letter Report, and referenced documents should be reviewed for further details and in-depth analyses of the data herein presented. The information and analytical data from all of these sources were utilized to form an up-to-date understanding of the current conditions at SWMU 13 from which COCs were identified and for which remedial actions were selected.

2.1.1 RFI

Prior to the RFI, three groundwater monitoring wells (MPT-13-MW01S, MPT-13-MW02S, and MPT-13-MW03S) were installed around the Old Firefighting Training Area as part of the expanded site investigation in 1987. The RFI for the Old Firefighting Training Area, SWMU 13, was conducted by ABB-ES in 1992 and 1994 as part of the Group I SWMUs field investigation activities. Field activities performed at SWMU 13, during the Group I SWMU's RFI, consisted of the following activities:

- Collection of sediment and subsurface soil samples
- Installation of piezometers and monitoring wells
- Groundwater screening (i.e., TerraProbe sampling)
- Collection and analysis of groundwater samples

1992 RFI Field Activities

Three sediment samples were collected from stormwater runoff swales located south and west of SWMU 13 during 1992 RFI field activities. The drainage swales were dry at the time of sampling and were therefore considered surface soil samples. Samples were collected from the 0 to 1 foot bgs interval using a stainless steel hand auger. One subsurface soil sample was collected from each soil boring (12 to 13 feet bgs) during installation of shallow monitoring wells MPT-13-MW04S, MPT-13-MW05S, and MPT-13-MW06S. Subsurface soil samples were collected from the 2.5 to 3.5 foot interval at locations MW04S and MW05S using a split spoon sampler and from 2.5 ft bgs at location MW06S using a hand auger. Five piezometers (MPT-13-P01, MPT-13-P03, MPT-13-P04, MPT-13-P05, and MPT-13-P06) were installed to characterize groundwater flow during the 1992 field events. The piezometers were installed to a depth of 10 feet bgs. Groundwater samples were collected from six monitoring wells (MPT-13-MW01S through MPT-13-MW06S) and one piezometer (MPT-13-P04). Groundwater and soil samples were analyzed for priority pollutant VOCs, SVOCs, pesticides, PCBs, and metals. Soil and groundwater sampling locations are shown on historical Figure 4-53 (ABB-ES, 1992) in Appendix A. Detailed information regarding the investigation methods and sampling procedures are provided in the NAVSTA Mayport RFI Workplan (ABB-ES, 1991) and in the NAVSTA Mayport GIR (ABB-ES, 1995b).

1994 RFI Field Activities

Field activities in 1994 included use of a TerraProbe to collect 15 soil and 13 groundwater samples for total petroleum hydrocarbon (TPH) analysis during a preliminary site screening. Four shallow monitoring wells (MPT-13-MW07S, MPT-13-MW08S, MPT-13-MW09S, and MPT-13-MW10S) were subsequently installed based on the field screening results. Groundwater samples were then collected from the four newly installed wells, from six existing wells (MPT-13-MW01S through MPT-13-MW10S), and an existing piezometer MPT-13-P04. The 11 groundwater samples were analyzed for priority pollutant VOCs, SVOCs, pesticides and PCBs, and metals. Soil and groundwater sampling locations are shown on historical Figure 5-1 (ABB-ES, 1996) in Appendix A. Detailed information regarding the investigation methods and sampling procedures are provided in the NAVSTA Mayport RFI Workplan (ABB-ES, 1991) and in the NAVSTA Mayport GIR (ABB-ES, 1995b).

2.1.1.1 RFI Field Investigation Results

The target analytes detected in the surface and subsurface soil and groundwater samples were compared to background screening values computed from stationwide samples (ABB-ES, 1995b), benchmark values from USEPA Region III risk-based concentrations (RBCs) (USEPA, 1995), and the Florida CTLs (FDEP, 1995).

Surface Soil

Four SVOCs, three pesticides, and eight inorganic analytes were detected in the surface soil samples collected during the RFI investigations. No VOC or PCB detections were reported. No SVOCs or pesticides were detected at concentrations exceeding RFI benchmark concentrations. Of the inorganic analytes detected, only arsenic was detected at concentrations greater than its RFI benchmark value.

Subsurface Soil

Three VOCs, one SVOC, one pesticide, and eight inorganic analytes were detected in the subsurface soil samples collected during the RFI investigation. No PCBs were detected in the subsurface soil samples. None of the VOCs, SVOCs, pesticides, or inorganics were detected at concentrations exceeding RFI benchmark values.

Groundwater

Two (2) VOCs, 3 SVOCs, and 14 inorganic analytes were detected in the groundwater samples collected during the RFI investigation. None of the VOC or SVOC detections exceeded RFI benchmark standards. No PCBs were detected in the groundwater. Six inorganic analytes were detected in excess of RFI BSVs and six inorganic analytes were detected at concentrations exceeding their respective benchmarks. However, the highest inorganic exceedances were detected in monitoring wells located hydraulically up-gradient or cross-gradient from SWMU 13. The RFI concluded, "Based on this locational relationship, these inorganic analytes do not appear to be site related."

2.1.1.2 RFI Assessment of Human Health Impacts

A preliminary risk characterization for SWMU 13 was conducted for potential exposures to current and future land-use scenarios. The subsurface soil and groundwater samples used in the assessment were collected in 1992 and 1994 during the RFI field investigations described above. No surface soil evaluation was completed because the area around SWMU 13 is either paved with asphalt and concrete or covered by buildings.

Soil

No analytes were detected at concentrations exceeding screening values. Therefore, no human health COPCs were selected.

Groundwater

None of the organic analytes detected in groundwater samples exceeded any of the BSVs used in the RFA-VSI report. However, three inorganic analytes (antimony, iron, and manganese) were selected as human health COPCs. Antimony was detected in a sample from one well at a concentration exceeding the USEPA Region III RBC benchmark of 1.5 µg/L, but was less than the FDEP guidance concentration of 6 µg/L. Iron exceeded the FDEP guidance concentration of 300 µg/L and the RFI BSV of 1,728 µg/L, but was less than the essential nutrient screening concentration of 13,267 µg/L. Manganese exceeded the USEPA Region III RBC (18 µg/L), the FDEP guidance concentration (50 µg/L), and the RFI BSV (210 µg/L).

Exposure to SWMU 13 human health COPCs was determined possible if the area adjacent was developed for residential use and the surficial aquifer used for domestic purposes. Exposure pathways were determined to be either ingestion of the groundwater as drinking water or inhalation of volatiles while showering. No VOCs were selected as human health COPCs, therefore, inhalation of VOCs while showering was not evaluated. Cancer risk was not calculated for SWMU 13 because there were no carcinogenic human health COPCs. A HI of 2 was calculated for the adult future resident ingestion of groundwater. Antimony (HQ = 0.19), iron (HQ = 0.45), and manganese (HQ = 1.4) contributed to the HI value of 2. This value exceeded the USEPA's and FDEP's target HI of 1 for ingestion of those chemicals in groundwater. Several uncertainties were discussed in the 1996 RFI relating to the assessment of human health impacts and are listed below:

- The groundwater contains concentrations of sodium, calcium, magnesium, and other inorganic analytes, that are typically found in brackish water. Based on the location of the site, which is in close proximity to the Atlantic Ocean and a tidally influenced river, the inorganics detected may be the result of saltwater intrusion or a result of the deposition of dredge materials during the construction of NAVSTA Mayport.
- The manganese drinking water reference dose (RfD) of 5.00^{-3} milligrams per kilogram per day (mg/kg/day) is based on a single epidemiological study conducted in Greece (Kondakis et al., 1989). Limitations of study design coupled with the lack of supporting studies may have resulted in the establishment of an artificially low oral drinking water RfD. Therefore, the HQ associated with manganese may be overestimated.
- Use of the USEPA Environmental Criteria Assessment Office provisional oral RfD for iron detected in groundwater to estimate non-cancer risk may result in an overestimate of risk. The oral RfD for iron based on average daily intake data for humans from the National Health and Nutrition Examination Survey II database represents an intake protective of iron deficiency anemia. The provisional RfD is based on nutritional needs instead of toxicity; therefore, this value may represent a very conservative criterion.

RFI remedial goal options (RGOs) for the human health COPCs in the groundwater at SWMU 13 were to designate the area as industrial use only and prevent the surficial aquifer from being used a potable water source (ABB-ES, 1996).

2.1.1.3 RFI Assessment of Ecological Impacts

An assessment of ecological impacts was not performed as part of the RFI because SWMU 13 is located in an industrial area that provides no habitat or exposure pathways for ecological receptors.

2.1.1.4 RFI Recommendations

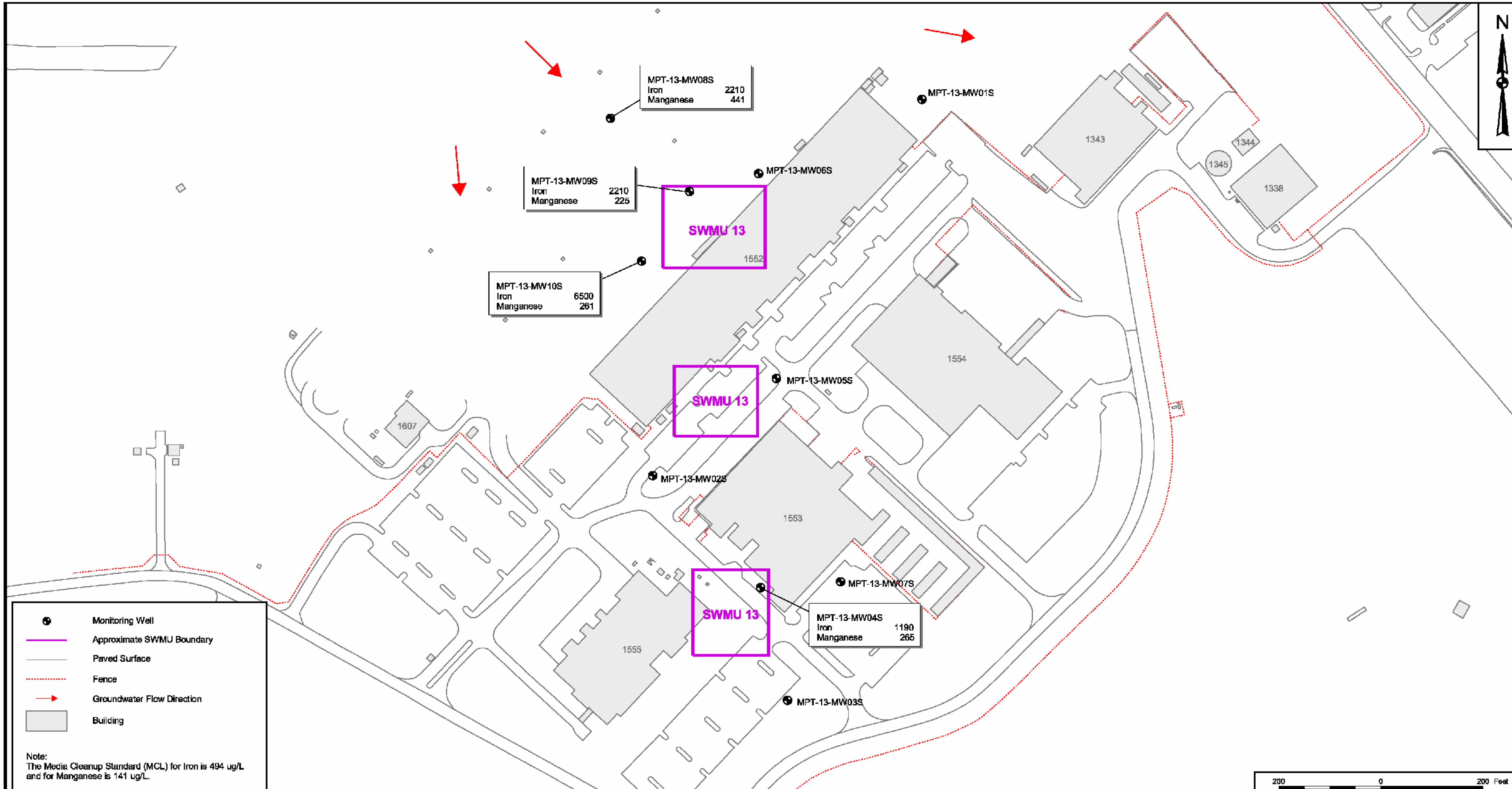
The RFI concluded that there did not appear to be a significant release to the environment from the firefighting training activities formerly conducted at SWMU 13. No soil analytes were detected in excess of risk-based or regulatory criteria. Inorganic analytes (antimony, iron, and manganese) were detected in the groundwater beneath SWMU 13 at concentrations that exceed criteria. The surficial aquifer beneath SWMU 13 should not be used as a potable water source. However, no current exposure pathways exist for the inorganic groundwater exceedances as long as SWMU 13 remains an industrial area.

The RFI report recommended no further investigation at that time based on future use of SWMU 13 remaining industrial, no carcinogenic human health COPCs were present and the relatively low non-carcinogenic risks associated with the site. However, the report recognized that the recommendation should be reevaluated if land use of the site changes in the future.

2.1.2 Confirmatory Groundwater Sampling – 2002 and 2003

TtNUS collected confirmatory groundwater samples at SWMU 13 in May 2002 from the site monitoring wells. The purpose of the confirmatory sampling was to identify the current concentrations of groundwater constituents that were reported to exceed regulatory standards in 1996 RFI for SWMU 13. Groundwater samples were collected from monitoring wells MPT-13-MW01S, MPT-13-MW02S, MPT-13-MW04S, MPT-13-MW05S MPT-13-MW07S, MPT-13-MW08S, MPT-13-MW09S, and MPT-13-MW10S and analyzed for inorganic constituents (antimony, iron, manganese, sodium, and vanadium) that were reported at concentrations exceeding regulatory groundwater criteria in the RFI. Select groundwater samples were collected from monitoring wells MPT-13-MW02S and MPT-13-MW06S and analyzed for 3&4-methylphenol and bis(2-ethylhexyl)phthalate (SVOCs) only. These were the only SVOCs detected in excess of benchmarks during 1994 RFI groundwater investigation.

In March of 2003, groundwater samples were collected from select site monitoring wells (MPT-13-MW04S, MPT-13-MW08S, MPT-13-MW09S, and MPT-13-MW10S) and analyzed for iron and manganese only. The purpose of the second confirmatory sampling event was to confirm the iron and manganese exceedances that were reported for the May 2002 groundwater sampling event. Confirmatory sampling locations are shown on Figure 2-2. The groundwater sampling performed during the 2002 and 2003 field events was conducted in accordance with FDEP standard operating procedures (SOPs) for low-flow purging and sampling techniques.



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY A. JANOCHA DATE 5/24/04
CHECKED BY C. METZ DATE 6/01/04
COST/SCHED-AREA
SCALE AS NOTED

GROUNDWATER WELLS WITH COC EXCEEDANCES
SWMU 13
NAVAL STATION MAYPORT
MAYPORT, FLORIDA

CONTRACT NO. N4231
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2.1.2.1 Confirmatory Groundwater Sampling Results

Four inorganic analytes (iron, manganese, sodium, and vanadium) were detected in groundwater samples collected in May 2002. Neither of the two SVOCs analyzed were detected in the groundwater samples collected from MW02S or MW06S (only wells with SVOC exceedances in RFI investigation). Iron and manganese concentrations exceeded benchmarks during the 2002 event. The second confirmatory groundwater sampling event (March 2003) results confirmed that iron and manganese concentrations were still in excess of criteria.

2.1.3 <u>CMS Data Set</u>

The results of soil samples collected during the 1992 and 1994 RFI investigations along with the groundwater results collected during the 2002 and 2003 confirmatory groundwater investigation were used to evaluate COPCs and to select COCs in this CMS. Groundwater results were only used from confirmatory events (2002 and 2003) and not the 1992 and 1994 investigations because they are more representative of current groundwater conditions. Table 2-1 provides a list of all samples for each medium that was used in the CMS. Tables listing the complete analytical results of all sampling events per medium are included in Appendix B.

2.2 COCs – HUMAN HEALTH

The determination of COCs for surface and subsurface soil and groundwater at SWMU 13 involved a three-step process as described in Section 1.4.3:

1. Determination of COIs
2. Identification of the COPCs
3. Selection of COCs

COIs and COPCs were determined in the RFI; however, since the RFI was issued, new soil and groundwater CTLs have been promulgated. The COIs and COPCs for SWMU 13 are independently reevaluated in the following sections to select the COCs to be carried forward in the CMS remedy selection process.

2.3 COIs – HUMAN HEALTH

The COIs included any contaminant detected at least once in validated analytical results for environmental samples in any medium collected at SWMU 13. Validated groundwater results from the

TABLE 2-1

SWMU 13, SOIL AND GROUNDWATER SAMPLE IDENTIFICATION
NAVSTA MAYPORT, FLORIDA

Sample Location	Sample ID	Sample Date	Volatile Organics	Semivolatile Organics	Inorganics	Pesticides	TPH
Surface Soil							
MPT-13-SD01	MPT-13-SD-1	1/23/1992	✔	✔	✔	✔	
MPT-13-SD02	MPT-13-SD-2	1/23/1992	✔	✔	✔	✔	
MPT-13-SD03	MPT-13-SD-3	1/23/1992	✔	✔	✔	✔	
Subsurface Soil							
MPT-13-MW04S	MPT-13-4	1/24/1992	✔	✔	✔	✔	
MPT-13-MW04S	MPT-13-4-D	1/24/1992	✔	✔	✔	✔	
MPT-13-MW05S	MPT-13-5	1/24/1992	✔	✔	✔	✔	
MPT-13-MW06S	MPT-13-6	1/24/1992	✔	✔	✔	✔	
MPT-13-SB01	MPT-13-SB01	1994					✔
MPT-13-SB02	MPT-13-SB02	1994					✔
MPT-13-SB03	MPT-13-SB03	1994					✔
MPT-13-SB04	MPT-13-SB04	1994					✔
MPT-13-SB05	MPT-13-SB05	1994					✔
MPT-13-SB06	MPT-13-SB06	1994					✔
MPT-13-SB07	MPT-13-SB07	1994					✔
MPT-13-SB08	MPT-13-SB08	1994					✔
MPT-13-SB09	MPT-13-SB09	1994					✔
MPT-13-SB10	MPT-13-SB10	1994					✔
MPT-13-SB11	MPT-13-SB11	1994					✔
MPT-13-SB12	MPT-13-SB12	1994					✔
MPT-13-SB13	MPT-13-SB13	1994					✔
MPT-13-SB14	MPT-13-SB14	1994					✔
MPT-13-SB15	MPT-13-SB15	1994					✔
Groundwater							
MPT-13-MW01S	MPT-13-MW01S-01	5/14/2002		✔×	✔×		
MPT-13-MW02S	MPT-13-MW02S-01	5/14/2002		✔×	✔×		
MPT-13-MW02S	MPT-13-MW02S-01-D	5/14/2002		✔×	✔×		
MPT-13-MW04S	MPT-13-MW04S-01	5/13/2002		✔×	✔×		
MPT-13-MW05S	MPT-13-MW05S-01	5/13/2002		✔×	✔×		
MPT-13-MW06S	MPT-13-MW06S-01	5/16/2002		✔×	✔×		
MPT-13-MW07S	MPT-13-MW07S-01	5/13/2002		✔×	✔×		
MPT-13-MW08S	MPT-13-MW08S-01	5/16/2002		✔×	✔×		
MPT-13-MW09S	MPT-13-MW09S-01	5/16/2002		✔×	✔×		
MPT-13-MW10S	MPT-13-MW10S-01	5/14/2002		✔×	✔×		
MPT-13-MW04S	MPT-13-MW04S	3/12/2003			✔×		
MPT-13-MW08S	MPT-13-MW08S	3/12/2003			✔×		
MPT-13-MW09S	MPT-13-MW09S	3/12/2003			✔×		
MPT-13-MW10S	MPT-13-MW10S	3/12/2003			✔×		

✔× = Only select parameters analyzed. See Section 2.1.2 of text.

confirmatory events (2002 and 2003) was used because they were most representative of current conditions. The locations of soil and groundwater samples collected at SWMU 13 during the RFI field activities are shown on historical Figure 4-53 (ABB-ES, 1992) and Figure 5-1 (ABB-ES, 1996), which are provided in Appendix A. Groundwater sample locations from the 2002 and 2003 confirmatory sampling activities were provided on Figure 2-1 or Figure 2-2. The revised list of COIs for soil and groundwater at SWMU 13 is provided in Table 2-2.

2.3.1 <u>COPCs – Human Health</u>

The maximum concentration of the COIs for each environmental medium was compared to the Florida CTLs (Chapter 62-777, FAC) for surface soil, subsurface soil, and groundwater, as appropriate. Section 1.3.7.2 provides a detailed description of the process for the identification of COPCs.

Calcium, magnesium, potassium, and sodium are considered to be essential human nutrients and were not included in the COPC selection process.

2.3.1.1 Selection of Surface Soil COPCs – Human Health

The COPC screening evaluation for soil involves an evaluation of COIs for residential direct exposure and leaching to groundwater. The residential direct exposure evaluation involves an adjustment of the CTLs (Chapter 62-777, FAC) to account for the number of carcinogens and the number of non-carcinogens affecting the same target organ/system. For example, as shown in Table 2-3, because seven contaminants were present in surface soil that were carcinogens, the residential direct exposure SCTLs for these contaminants were divided by seven (7) to achieve the initial target criteria. Because less than 20 surface soil samples were collected at SWMU 13, none of the COIs were eliminated based on frequency of detection. The initial residential direct exposure COPC screening process for surface soil identified one contaminant (arsenic) that exceeded the adjusted SCTLs (initial target criteria).

The final surface soil COPC selection was performed using adjusted SCTLs. Table 2-4 presents the comparison of maximum concentration with the adjusted SCTLs and lists no contaminants as final Residential Direct Exposure COPCs. Arsenic was selected as a final COPC because it's cumulative cancer or target organ effect ratio was less than one and its maximum detected concentration was less than the adjusted SCTL.

Because surface water (i.e., St. Johns River) is not located within 300 feet of SWMU 13, leaching of soil to marine surface water was not evaluated. The leaching to groundwater evaluation involves a direct comparison to the leaching to groundwater CTLs. Table 2-5 shows the leaching to groundwater

TABLE 2-2

SWMU 13, CONTAMINANTS OF INTEREST IN SOIL AND GROUNDWATER NAVSTA MAYPORT, FLORIDA

Chemical	Surface Soil	Subsurface Soil	Groundwater
Volatile Organics			
Carbon Disulfide		X	
Trichlorofluoromethane		X	
Xylenes, Total		X	
Semivolatile Organics			
Bis(2-Ethylhexyl)phthalate	X		
Chrysene	X		
Fluoranthene	X		
Pyrene	X	X	
Pesticides/PCBs			
4,4'-DDD	X		
4,4'-DDE	X		
Chlordane	X	X	
Inorganics			
Antimony		X	
Arsenic	X	X	
Barium	X	X	
Chromium	X	X	
Cobalt	X		
Copper	X	X	
Iron			X
Lead	X	X	
Manganese			X
Nickel		X	
Sodium			X
Vanadium	X		X
Zinc	X	X	

Notes:
DDD – dichlorodiphenyldichloroethane
DDE - dichlorodiphenyldichloroethylene

TABLE 2-3

SWMU 13, SURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

Chemical of Interest	Chemical Abstract Number	Frequency of Detection	Maximum Concentration (mg/kg)	SCTL Residential[1] (mg/kg)	Target Organ/System or Effect	Adjustment Divisor[2]	Initial Target Criteria[3] (mg/kg)	Exceeds Initial Target Levels[4]
Semivolatile Organics								
Bis(2-Ethylhexyl) Phthalate	117-81-7	2/3	0.17	76	Carcinogen -Liver	7	10.9	No
Chrysene	218-01-9	1/3	0.059	140	Carcinogen	7	20	No
Fluoranthene	206-44-0	1/3	0.053	2,900	Blood -Kidney -Liver	3	966.7	No
Pyrene	129-00-0	1/3	0.051	2,200	Kidney	2	1,100	No
Pesticides/PCBs								
4,4'-DDD	72-54-8	1/3	0.0041	4.6	Carcinogen	7	0.7	No
4,4'-DDE	72-55-9	2/3	0.0024	3.3	Carcinogen	7	0.5	No
Chlordane	57-74-9	1/3	0.0094	3.1	Carcinogen -Liver	7	0.44	No
Inorganics								
Arsenic	7440-38-2	3/3	0.69	0.8	Carcinogen -Cardiovascular -Skin	7	0.1	**Yes**
Barium	7440-39-3	3/3	5.2	110	Cardiovascular	3	37	No
Chromium[5]	7440-47-3	3/3	3.7	210	Carcinogen -Respiratory	7	30	No
Cobalt	7440-48-4	2/3	2.5	4,700	Cardiovascular -Immunological -Neurological-Reproductive	3	1,567	No
Copper	7440-50-8	3/3	5.4	110	None Specified	1	110	No
Lead	7439-92-1	2/3	7.5	400	Neurological	2	200	No
Vanadium	7440-62-2	3/3	3.7	15	None Specified	1	15	No
Zinc	7440-66-6	3/3	37.6	23,000	Blood	2	11,500	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential Direct Exposure - Chapter 62-777 FAC, May 1999.
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ.
3 - The SCTL for direct exposure to soil in a residential setting from Chapter 62-777 FAC, Table 2, was divided by the adjustment divisor to account for cumulative effects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Residential screening values used were for Hexavalent Chromium. The lab results are for Chromium, which there is no SCTL for.

TABLE 2-4

SWMU 13, SURFACE SOIL FINAL COPCs – RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

Initial COPC	Chemical Abstract Number	Frequency of Detection	Maximum Concentration (mg/kg)	SCTL Residential[1] (mg/kg)	Target Organ/System or Effect	Cumulative Cancer or Target Organ/System Analysis[2]			Adjustment Divisor[3]	Direct Exposure Target Criteria[4] (mg/kg)	COPC Based on Residential Direct Exposure[5] (Yes/No)
						Carcinogen	Cardiovascular	Skin			
Inorganics											
Arsenic	7440-38-2	3/3	0.69	0.8	Carcinogen -Cardiovascular - Skin	0.86	0.86	0.86	1	0.8	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential Direct Exposure - Chapter 62-777 FAC, May 1999.
2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. If the Cumulative Sum is less than 1, then the Adjustment Divisor is equal to 1.
4 - The SCTL for direct exposure with soil in a residential setting from Chapter 62-777 FAC, Table 2, was divided by the adjustment divisor to account for cumulative effects.
5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

TABLE 2-5

SWMU 13, SURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

Chemical of Interest	Chemical Abstract Number	Frequency of Detection	Maximum Concentration (mg/kg)	SCTL Leaching to Groundwater [1] (mg/kg)	SCTL Leaching to Surface Water [2] (mg/kg)	Leaching Target Criteria [3] (mg/kg)	COPC Based on Leaching[4] (Yes/No)
Semivolatile Organics							
Bis(2-Ethylhexyl) Phthalate	117-81-7	2/3	0.17	3600	NA	3600	No
Chrysene	218-01-9	1/3	0.059	77	NA	77	No
Fluoranthene	206-44-0	1/3	0.053	1200	NA	1200	No
Pyrene	129-00-0	1/3	0.051	880	NA	880	No
Pesticides/PCBs							
4,4'-DDD	72-54-8	1/3	0.0041	4	NA	4	No
4,4'-DDE	72-55-9	2/3	0.0024	18	NA	18	No
Chlordane	57-74-9	1/3	0.0094	9.6	NA	9.6	No
Inorganics							
Arsenic	7440-38-2	3/3	0.69	29	NA	29	No
Barium	7440-39-3	3/3	5.2	1600	NA	1600	No
Chromium[5]	7440-47-3	3/3	3.7	38	NA	38	No
Cobalt	7440-48-4	2/3	2.5	No Criteria	NA	No Criteria	No
Copper	7440-50-8	3/3	5.4	No Criteria	NA	No Criteria	No
Lead	7439-92-1	2/3	7.5	No Criteria	NA	No Criteria	No
Vanadium	7440-62-2	3/3	3.7	980	NA	980	No
Zinc	7440-66-6	3/3	37.6	6000	NA	6000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 FAC, May 1999.
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surface water - Chapter 62-777 FAC, May 1999.
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable).
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL Residential screening values used were for Hexavalent Chromium. The lab results are for Chromium, which there is no SCTL for.
NA - Not Applicable.

evaluation. The leaching to groundwater evaluation determined that no contaminants have the potential to leach from the soil and impact groundwater. Therefore, no contaminants were selected as COPCs for surface soil.

2.3.1.2 Selection of Subsurface Soil COPCs – Human Health

Similar to the evaluation of surface soils, the COPC screening evaluation for subsurface soil involves an evaluation of COIs for residential direct exposure and leaching to groundwater. The residential direct exposure evaluation involves an adjustment of the CTLs (Chapter 62-777, FAC) to account for the number of carcinogens and the number of non-carcinogens affecting the same target organ/system. For example, as shown in Table 2-6, because three contaminants were present in subsurface soil that were carcinogens, the residential direct exposure SCTLs for these contaminants were divided by three (3) to achieve the initial target criteria. Less than 20 subsurface soil samples were collected at SWMU 13; therefore, none of the COIs were eliminated based on frequency of detection. The initial residential direct exposure COPC screening process for subsurface soil identified TPH and arsenic as contaminants that exceeded the adjusted SCTLs (initial target criteria).

The final subsurface soil COPC selection was performed using adjusted SCTLs. Table 2-7 presents the comparison of maximum concentrations with the adjusted SCTLs and lists the contaminant TPH as the only final Residential Direct Exposure COPCs. TPH was selected as a final COPC because it’s cumulative cancer or target organ effect ratio was less than one and its maximum detected concentration was less than the adjusted SCTL.

Because surface water (i.e., St. Johns River) is located more than 300 feet from SWMU 13, leaching of subsurface soil to marine surface water was not evaluated. The leaching to groundwater evaluation involves a direct comparison to the leaching to groundwater CTLs. Table 2-8 shows the leaching to groundwater evaluation. The leaching to groundwater evaluation determined that two contaminants, antimony and TPH, have the potential to leach from the soil and impact groundwater/surface water. Therefore, antimony and TPH were selected as final COPCs for subsurface soil at SWMU 13.

2.3.1.3 Selection of Groundwater COPCs – Human Health

The initial COPC screening process for groundwater begins with separating COIs that have a primary or secondary standard. COIs with a primary or secondary standard are compared directly to the GCTLs to determine initial COPCs. COIs without a primary or secondary standard are adjusted according to the number of carcinogens or the number of non-carcinogens affecting the same target organ/system.

TABLE 2-6

SWMU 13, SUBSURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

Chemical of Interest	Chemical Abstract Number	Frequency of Detection	Maximum Concentration (mg/kg)	SCTL Residential[1] (mg/kg)	Target Organ/System or Effect	Adjustment Divisor [2]	Initial Target Criteria [3] (mg/kg)	Exceeds Initial Target Levels[4]
Volatile Organics								
Carbon Disulfide	75-15-0	1/3	0.002	200	Developmental -Neurological	3	67	No
Xylenes, Total	1330-20-7	2/3	0.01	5,900	Body Weight -Mortality -Neurological	3	1,967	No
Trichlorofluoromethane	75-69-4	1/3	0.036	200	Cardiovascular -Kidney -Mortality - Respiratory	3	67	No
Semivolatile Organics								
Pyrene	129-00-0	1/3	0.042	2,200	Kidney	2	1,100	No
TPH	X0003	2/15	449	340	Multiple Endpoints Mixed Contaminants	1	340	**Yes**
Pesticides/PCBs								
Chlordane	57-74-9	1/3	0.37	3.1	Carcinogen -Liver	3	1.0	No
Inorganics								
Antimony	7440 38 2	1/3	9.8	26	Blood -Mortality	2	13	No
Arsenic	7440 39 3	2/3	0.52	0.8	Carcinogen -Cardiovascular -Skin	3	0.27	**Yes**
Barium	7440-39-3	3/3	8.1	110	Cardiovascular	3	37	No
Chromium[5]	18540-29-9	3/3	3.5	210	Carcinogen -Respiratory	3	70	No
Copper	7440 47 3	3/3	2	110	None Specified	1	110	No
Lead	7439-92-1	1/3	2.8	400	Neurological	3	133	No
Nickel	7440-02-0	1/3	3.2	110	Body Weight	1	110	No
Zinc	7439 92 1	1/3	19.4	23,000	Blood	2	11,500	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential Direct Exposure - Chapter 62-777 FAC, May 1999.
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ.
3 - The SCTL for direct exposure to soil in a residential setting from Chapter 62-777 FAC, Table 2, was divided by the adjustment divisor to account for cumulative effects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Residential screening values used were for Hexavalent Chromium. The lab results are for Chromium, which there is no SCTL for.

TABLE 2-7

SWMU 13, SUBSURFACE SOIL FINAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

Initial COPC	Chemical Abstract Number	Frequency of Detection	Maximum Concentration (mg/kg)	SCTL Residential[1] (mg/kg)	Target Organ/System or Effect	Cumulative Cancer or Target Organ/System Analysis[2]					Adjustment Divisor[3]	Direct Exposure Target Criteria[4] (mg/kg)	COPC Based on Residential Direct Exposure[5] (Yes/No)
						Blood	Carcinogen	Cardiovascular	Mortality	Skin			
Semivolatile Organics													
TPH	X0003	2/15	449	340	Multiple Endpoints Mixed Contaminants						1	340	**Yes**
Inorganics													
Arsenic	7440-39-3	2/3	0.52	0.8	Carcinogen -Cardiovascular - Skin		0.65	0.65		0.65	1	0.8	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential Direct Exposure - Chapter 62-777 FAC, May 1999.
2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. If the Cumulative Sum is less than 1, then the Adjustment Divisor is equal to 1.
4 - The SCTL for direct exposure with soil in a residential setting from Chapter 62-777 FAC, Table 2, was divided by the adjustment divisor to account for cumulative effects.
5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

TABLE 2-8

SWMU 13, SUBSURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

Chemical of Interest	Chemical Abstract Number	Frequency of Detection	Maximum Concentration (mg/kg)	SCTL Leaching to Groundwater [1] (mg/kg)	SCTL Leaching to Surface Water [2] (mg/kg)	Leaching Target Criteria [3] (mg/kg)	COPC Based on Leaching[4] (Yes/No)
Volatile Organic							
Carbon Disulfide	75-15-0	1/3	0.002	5.6	NA	5.6	No
Xylenes, Total	1330-20-7	2/3	0.01	0.2	NA	0.2	No
Trichlorofluoromethane	75-69-4	1/3	0.036	33	NA	33	No
Semivolatile Organics							
Pyrene	129-00-0	1/3	0.042	880	NA	880	No
TPH	X0003	2/15	449	340	NA	340	**Yes**
Pesticides/PCBs							
Chlordane	57-74-9	1/3	0.37	9.6	NA	9.6	No
Inorganics							
Antimony	7440 38 2	1/3	9.8	5	NA	5	**Yes**
Arsenic	7440 39 3	2/3	0.52	29	NA	29	No
Barium	7440-39-3	3/3	8.1	1600	NA	1600	No
Chromium[5]	18540-29-9	3/3	3.5	38	NA	38	No
Copper	7440 47 3	3/3	2	No Criteria	NA	No Criteria	No
Lead	7439-92-1	1/3	2.8	No Criteria	NA	No Criteria	No
Nickel	7440-02-0	1/3	3.2	130	NA	130	No
Zinc	7439 92 1	1/3	19.4	6000	NA	6000	No

Notes:
1 - SCTL – Soil Cleanup Target Level for Soil leaching to groundwater – Chapter 62-777 FAC, May 1999.
2 - SCTL – Soil Cleanup Target Level for Soil leaching to surface water – Chapter 62-777 FAC, May 1999.
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable).
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening value used for Chromium (Hexavalent).
NA - Not Applicable.

Because no contaminants have the same effect, the GCTLs for all of the COPCs were divided by 1. Because SWMU 13 is located more than 300 feet away from the nearest surface water body, the discharge of groundwater into surface water was not evaluated as a pathway of concern. The initial COPC screening process identified two contaminants, iron and manganese, that exceeded the adjusted GCTLs (initial target levels) as shown in Table 2-9.

A final COPC evaluation was performed according to the methodology detailed in Section 1.3.7.2. The maximum concentrations of all initial COPCs were compared to the adjusted GCTLs for all contaminants without a primary or secondary standard. Table 2-10 presents the comparison of maximum detections with the adjusted GCTLs and lists the final groundwater COPCs. Both initial COPCs, iron and manganese, were not selected as final COPCs.

Iron and manganese were not selected as final groundwater COPCs because these secondary groundwater contaminants were present in both an upgradient and cross-gradient well for this site. Review of historical groundwater flow maps [Figure 4-56 from Group 1 RFI and Figures 19 and 39 from the United States Geological Survey (USGS) provided in Appendix A] indicated that groundwater flow in this area is from the runway towards SWMU 13. This confirmed that monitoring well MPT-13-MW08S is upgradient and MPT-13-MW10S is cross-gradient to the associated SWMU 13 site. In addition, iron and manganese are not believed to be related to the former firefighting training excercises that were conducted at SWMU 13. Therefore, it was concluded that iron and manganese should not be included as COPCs for SWMU 13.

2.3.2 <u>COCs – Human Health</u>

The representative concentration of the COPCs for each environmental medium was compared to the State of Florida CTLs (Chapter 62-777, FAC) for surface soil, subsurface soil, and groundwater, as appropriate. Section 1.3.7.3 provides a detailed description of the process for the identification of COCs.

2.3.2.1 Selection of Surface Soil COCs – Human Health

There were no surface soil COPCs, therefore, a surface soil COC evaluation is not required and there are no surface soil COCs for SWMU 13.

2.3.2.2 Selection of Subsurface Soil COCs – Human Health

There were two final subsurface soil COPCs (TPH and antimony), but neither were selected as a subsurface soil COC for SWMU 13. Table 2-11 presents the comparison of maximum detections with

TABLE 2-9

SWMU 13, GROUNDWATER INITIAL COPCs – GCTLS
NAVSTA MAYPORT, FLORIDA

Chemical of Interest	Chemical Abstract Number	Frequency of Detection	Maximum Concentration (µg/L)	GCTL[1] (µg/L)	Target Criteria[2] (P/S, HH)	Target Organ/System or Effect	Adjustment Divisor[3]	Initial Target Level[4] (µg/L)	Exceeds Initial Target Level[5]
Constituents with Primary or Secondary Standards									
Inorganics									
Iron	7439-89-6	12/12	6500	300	P/S	Blood -Gastrointestinal	1	300	**Yes**
Manganese	7439-96-5	12/12	441	50	P/S	Neurological	1	50	**Yes**
Constituents without Primary or Secondary Standards									
Inorganics									
Vanadium	7440-62-2	6/8	1.8	49	HH	None Specified	1	49	No

Notes:
1 - GCTL - Groundwater Cleanup Target Levels - Chapter 62-777 FAC May 1999.
2 - P/S - Primary Standard/Secondary Standard - FAC 62-550 and Chapter 62-777, Table 1, dated May 1999. HH - Human Health Criteria.
3 - Adjustment Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. Adjustment Divisor for Primary/Secondary Standard is 1.
4 - The GCTL from Chapter 62-777 FAC, Table 1, was divided by the number (i.e., adj. divisor) of carcinogenic COPCs or non-carcinogenic COPCs that affect the same target organ/system to account for cumulative effects.
5 - Comparison of the Initial Target Levels with the Maximum Concentration.

TABLE 2-10

SWMU 13, GROUNDWATER FINAL COPCs - GCTLS
NAVSTA MAYPORT, FLORIDA

Initial COPCs	Chemical Abstract Number	Frequency of Detection	Maximum Concentration (µg/L)	GCTL[1] (µg/L)	Target Criteria[2]	Target Organ/System or Effect	Cumulative Cancer or Target Organ/System Analysis			Adjustment Divisor[3]	Final Target Level[4] (µg/L)	Exceeds Final Target Level[5]
							Blood	Gastrointestinal	Neurological			
Constituents with Primary or Secondary Standards												
Inorganics												
Iron	7439-89-6	12/12	6500	300	P/S	Blood - Gastrointestinal	21.7	21.7		1	300	**No[6]**
Manganese	7439-96-5	12/12	441	50	P/S	Neurological			8.82	1	25	**No[6]**

Notes:
1 - GCTL - Groundwater Cleanup Target Levels - Chapter 62-777 FAC May 1999.
2 - P/S - Primary Standard/Secondary Standard - FAC 62-550 and Chapter 62-777, Table 1, dated May 1999. HH - Human Health Criteria.
3 - Adjustment Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. Adjustment Divisor for Primary/Secondary Standard is 1.
4 - The GCTL from Chapter 62-777 FAC, Table 1, was divided by the number (i.e., adj. divisor) of carcinogenic COPCs or non-carcinogenic COPCs that affect the same target organ/system to account for cumulative effects.
5 - Comparison of the Initial Target Levels with the Maximum Concentration.
6 – See section 2.3.1.3 of CMS text for explanation of why iron and manganese were not selected as final groundwater COPCs

TABLE 2-11

SWMU 13 , SUBSURFACE COCs - LEACHING
NAVSTA MAYPORT, FLORIDA

COPC[1]	Chemical Abstract Number	Maximum Concentration (mg/kg)	Representative Concentration[2] (mg/kg)	SCTL Leaching to Groundwater[3] (mg/kg)	SCTL Leaching to Surface Water[3] (mg/kg)	Background Concentration[4] (mg/kg)	Media Cleanup Standard – Leaching[5] (mg/kg)	COC Based on Leaching[6]
Semivolatile Organics								
TPH	X0003	449	262	340	NA	-	340	No
Inorganics								
Antimony	7440-38-2	9.8	9.8	5	NA	-	5	No[7]

Notes:
1 - COPC – Chemical of potential concern.
2 - The representative concentration is the 95 percent UCL (where appropriate) or the maximum detected concentration, whichever is less.
3 - SCTL - Soil Cleanup Target Level for Leaching - Chapter 62-777 FAC, May 1999.
4 - Mayport background screening value (TtNUS, 2000).
5 - The Media Cleanup Standard (MCS) Leaching is the Leachability SCTL divided by Adjustment Divisor or the background concentration, whichever is greater.
6 - A COPC is selected as a COC if the representative concentration exceeds the Media Cleanup Standard - Leachability.
7 - See Section 2.3.2.2 for explanation of why this contaminant is not a COC.
NA - Not Applicable

maximum contaminant levels (MCLs). The COC evaluation for each is discussed in the following two paragraphs.

In subsurface soil, a 95 percent UCL was used to calculate a site representative concentration for the COPC TPH because there were more than 10 samples collected. A total of 15 TPH subsurface soil samples were analyzed, of which, 13 were found to be less than the method detection limits. The method detection limit was never provided in the 1996 RFI for Group I SWMUs and the laboratory data for the 15 TPH samples was missing from the Appendix of the RFI. As a result, a method detection limit of 200 mg/kg was used in the 95 percent UCL calculation. TPH subsurface soil samples collected at other Group I SWMUs during concurrent investigations that were analyzed by the same method (USEPA Method 418.1) had method detection limits of 2 mg/kg. As a safety factor, a method detection limit value two orders of magnitude (200 mg/kg) higher was used for the TPH samples analyzed at SWMU 13. The calculated site representative concentration of TPH was less than soil leaching to groundwater SCTLs (Table 2-10) and was therefore not selected as a subsurface soil COC. Calculations for the TPH 95 percent UCL concentration are provided in Appendix C.

A 95 percent UCL was not calculated for the COPC antimony because less than 10 samples were collected. For this reason, the maximum concentration detected was used instead of a representative concentration for the site. The maximum concentration of antimony (9.8 µg/L) exceeded its leaching to groundwater criteria of 5 µg/L but was less than the residential criteria. The maximum concentration of antimony was detected in the subsurface soil sample collected during the installation of monitoring well MPT-13-MW06S in January 1992. However, no antimony detections were reported in the groundwater samples collected from monitoring well MPT-13-MW06S in 1992 or 1994. Furthermore, antimony was only detected in 1 of 11 wells (not in MW06S and below standards) sampled in 1994 and in none of the 8 wells sampled in 2002 (most recent groundwater sampling event). Antimony presence is not believed to be a result of the former firefighting training exercises that were performed at SWMU 13 and does not appear to be leaching into the groundwater. For the above reasons, antimony was not selected as a subsurface soil COC for SWMU 13.

The soil COC evaluation resulted in no residential of industrial soil COCs being identified for SWMU 13.

2.3.2.3 Selection of Groundwater COCs – Human Health

There were no final groundwater COPCs, therefore, a groundwater COC evaluation is not required and there are no groundwater COCs for SWMU 13.

2.4 COCs IN SOIL – ECOLOGICAL

Based on the RFI findings, no risk to terrestrial wildlife populations was determined to be likely due to exposure to surface soil. No pathway for ecological exposure to subsurface soil was identified in the RFI. Additionally, the RFI found groundwater discharge into the St. Johns River did not pose a risk to aquatic receptors including fish, amphibians, plants, and invertebrates. This is based on the assumption that the groundwater concentration at the surface water discharge point will be lower than the concentration measured in the well, due to advection, dispersion, mixing, and retardation.

2.4.1 COC Summary

No COCs for surface soil and subsurface soil or groundwater were identified for SWMU 13.

2.5 VOLUMES OF CONTAMINATED MEDIA

No COCs were identified for surface or subsurface soil or groundwater at SWMU 13, therefore, there is no volume of contaminated media.

2.6 IDENTIFICATION AND SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES

Corrective measure technologies are identified and screened to address the CAOs identified for SWMU 13 (see Section 1.3.4). Groundwater technologies are not required because there were no groundwater COCs at SWMU 13. Soil technologies are not required because there were no soil COCs identified for this SWMU.

A comparison of the COIs in surface soil, subsurface soil, and groundwater to residential standards was performed in this evaluation. This evaluation shows that no contaminants detected at SWMU 13 exceed residential standards. Therefore, corrective action is not required for SWMU 13.

2.7 RECOMMENDATION FOR A FINAL GROUNDWATER CORRECTIVE MEASURES ALTERNATIVE

Based on the evaluation results showing no contaminants exceeded residential standards, No Further Action is recommended for addressing the soil and groundwater at SWMU 13.

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APPENDIX A

HISTORICAL FIGURES

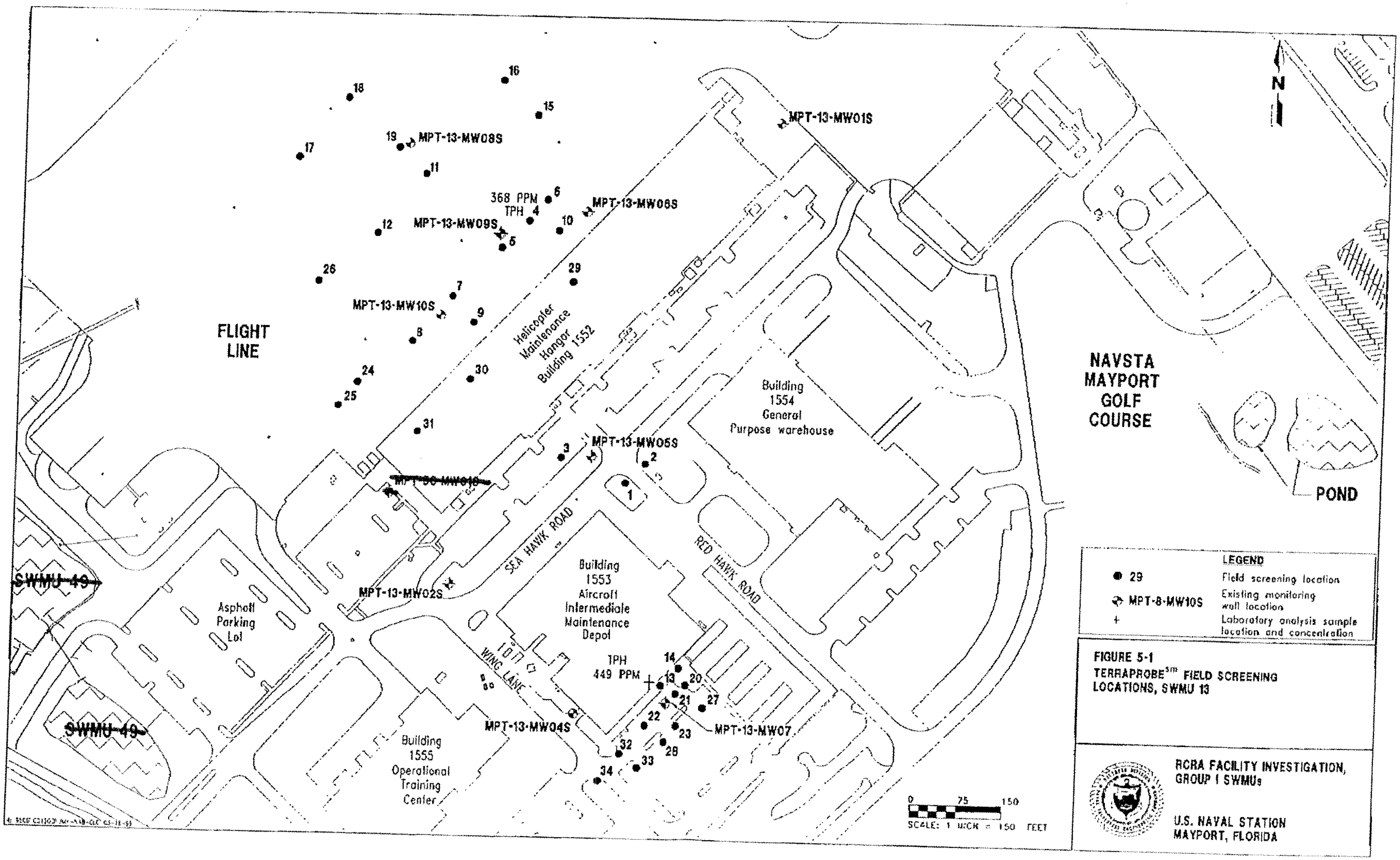

FIGURE 5-1
TERRAPROBE[SM] FIELD SCREENING LOCATIONS, SWMU 13

RCRA FACILITY INVESTIGATION, GROUP I SWMUs

U.S. NAVAL STATION MAYPORT, FLORIDA

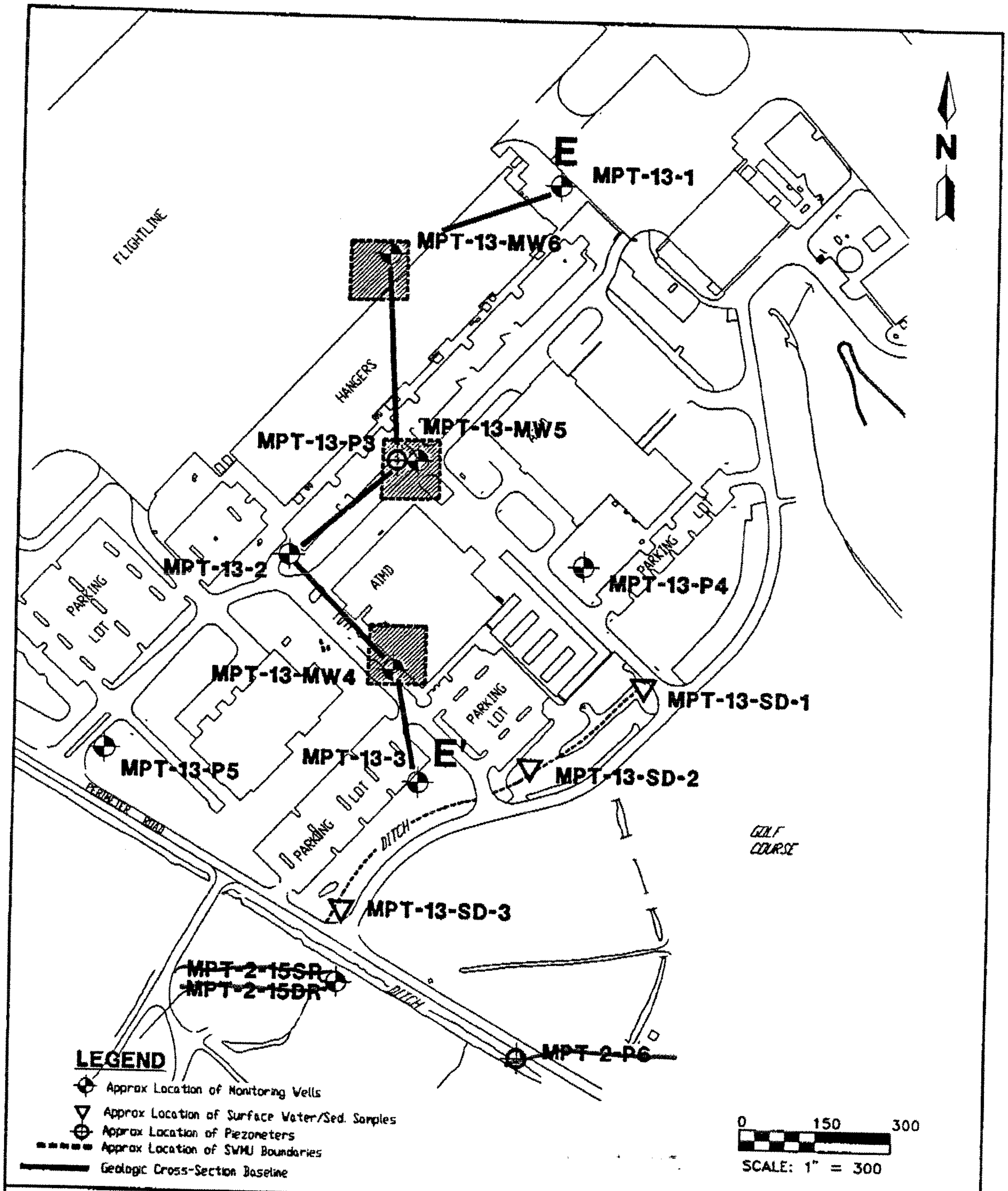

FIGURE 4-53
SWMU 13 - OLD FIRE FIGHTING TRAINING AREA SITE PLAN

RCRA FACILITY INVESTIGATION REPORT PHASE I

U.S. NAVAL STATION MAYPORT, FLORIDA

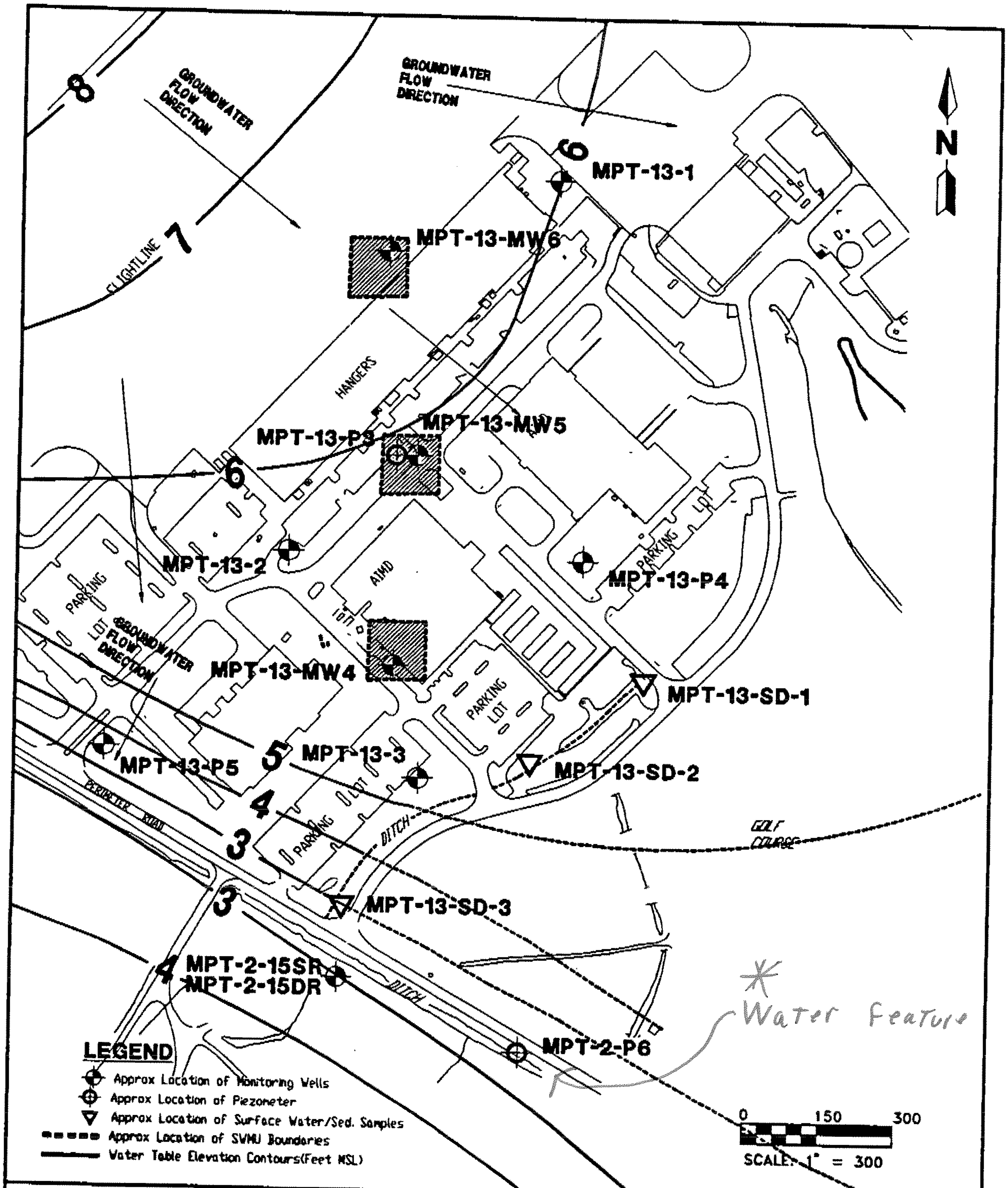

FIGURE 4-56

SWMU 13 - OLD FIRE FIGHTING TRAINING AREA WATER TABLE SURFACE MAP

RCRA FACILITY INVESTIGATION REPORT PHASE I

U.S. NAVAL STATION MAYPORT, FLORIDA

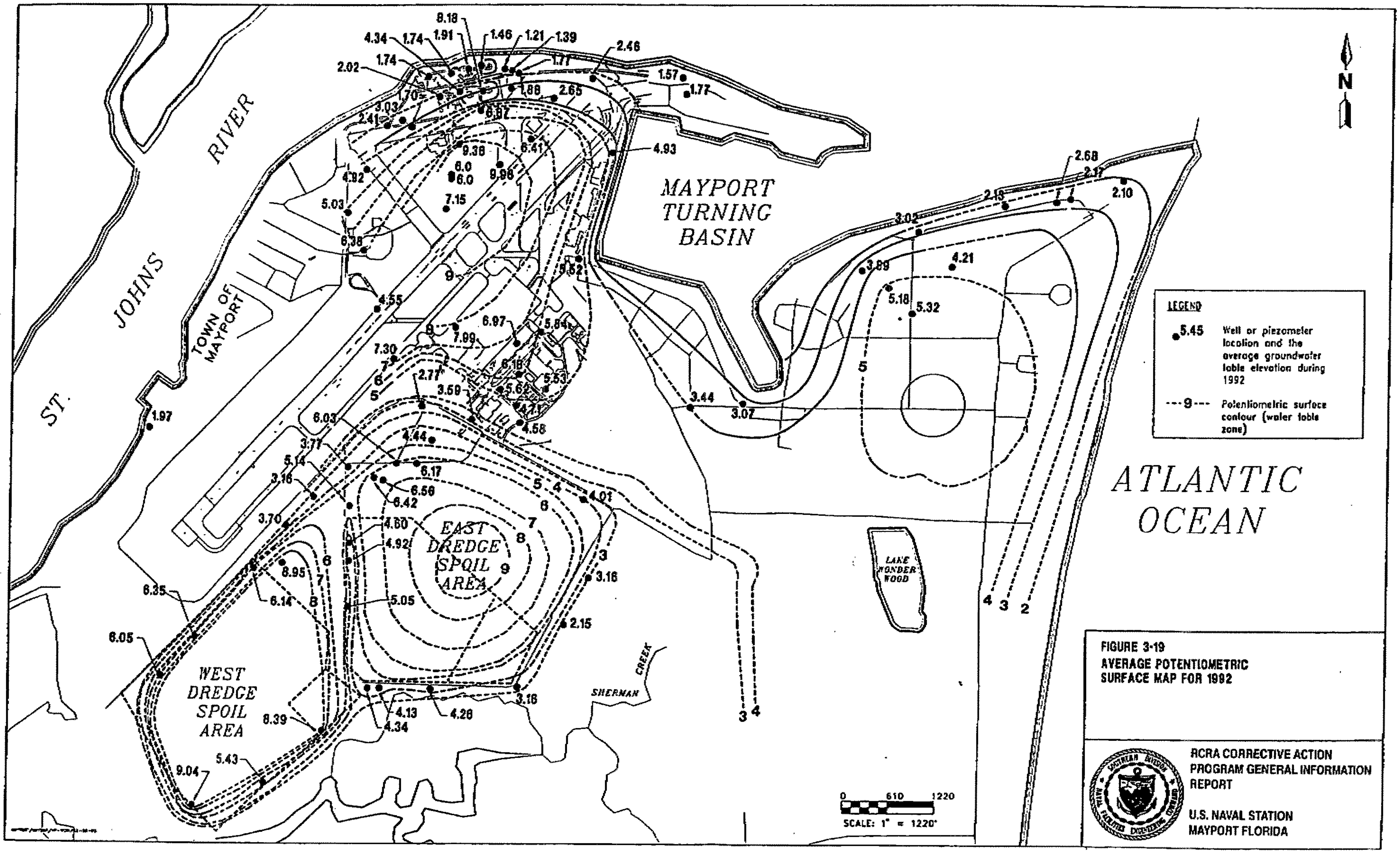

FIGURE 3-19
AVERAGE POTENTIOMETRIC SURFACE MAP FOR 1992

RCRA CORRECTIVE ACTION PROGRAM GENERAL INFORMATION REPORT

U.S. NAVAL STATION MAYPORT FLORIDA

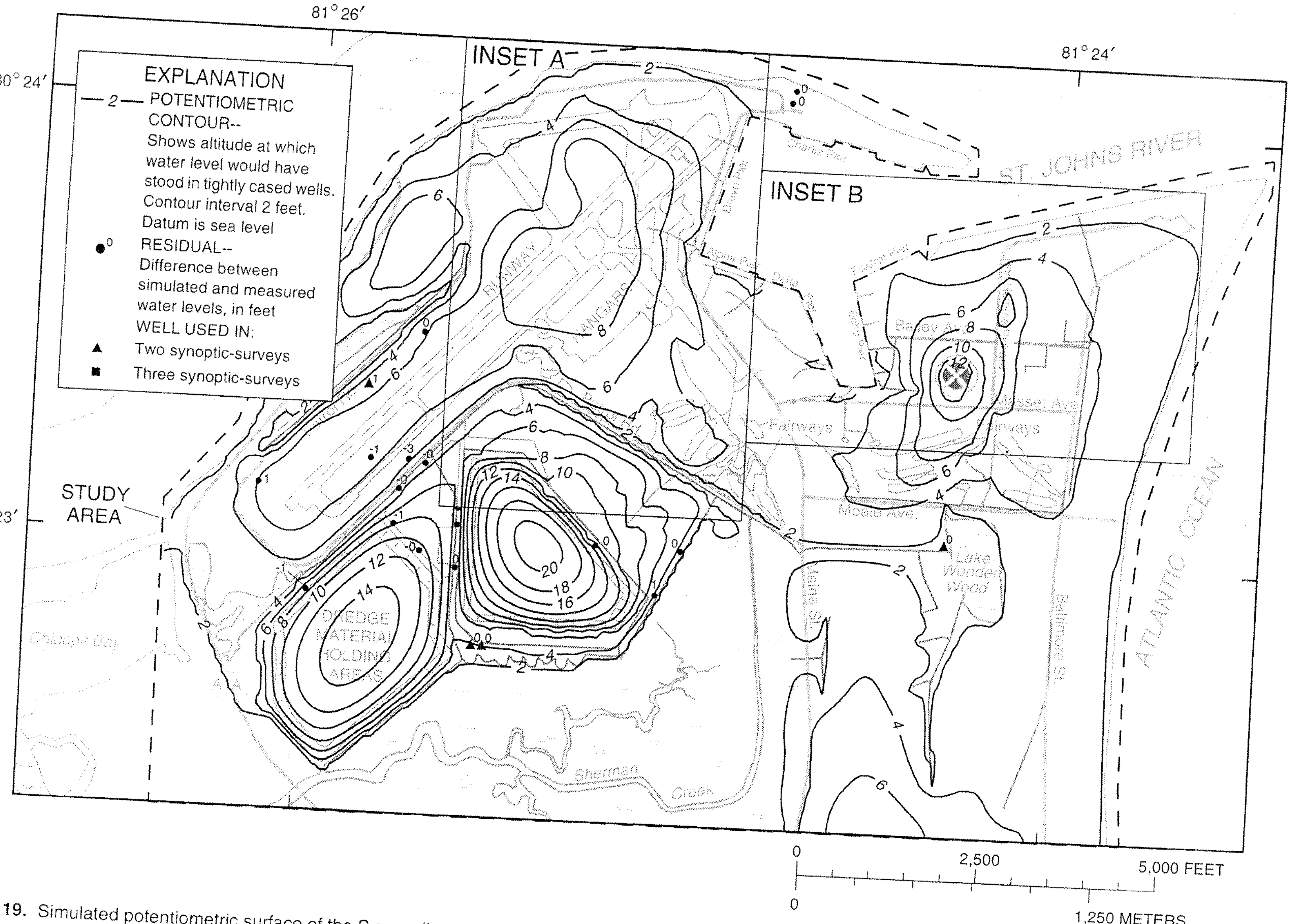

Figure 19. Simulated potentiometric surface of the S-zone (layer 1) on July 17, 1995.

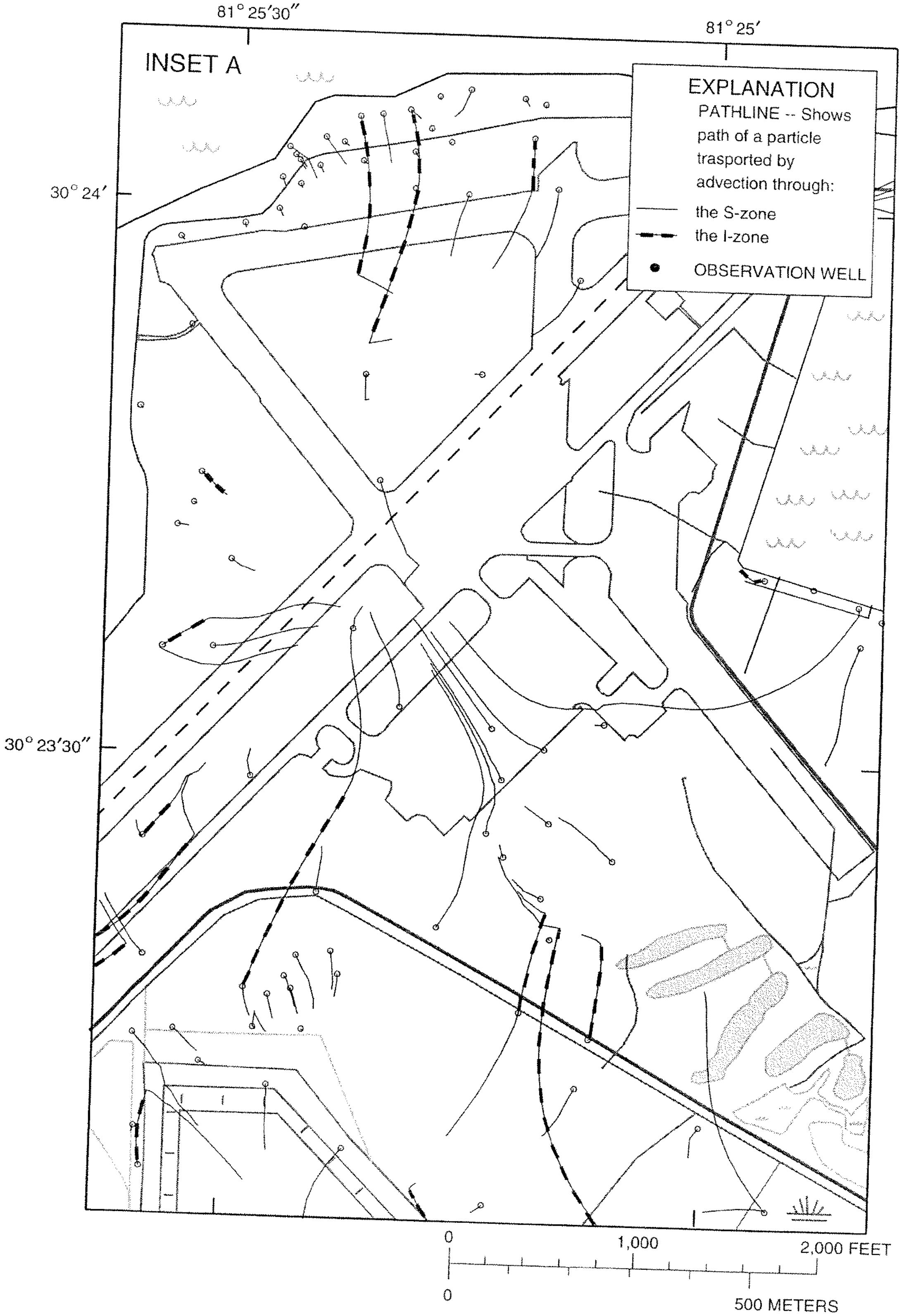

Figure 39. Inset A.

APPENDIX B

CMS DATA SET

GROUNDWATER

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW01S MPT-13-MW01S-01 GW 5/14/2002	MPT-13-MW02S MPT-13-MW02S-01 GW 5/14/2002	MPT-13-MW02S MPT-13-MW02S-01-AVG GW 5/14/2002	MPT-13-MW02S MPT-13-MW02S-01-D GW 5/14/2002	MPT-13-MW04S MPT-13-MW04S GW 3/12/2003
Semivolatile Organics (ug/L)					
3&4-METHYLPHENOL		9.6 U	9.7 U	9.8 U	
BIS(2-ETHYLHEXYL)PHTHALATE		9.6 U	9.7 U	9.8 U	
Inorganics (ug/L)					
ANTIMONY	2.1 U	2.1 U	2.1 U	2.1 U	
IRON	275	159	184.5	210	1170
MANGANESE	55.5	47.1	46.75	46.4	265
SODIUM	20600	552000	524500	497000	
VANADIUM	0.46 U	0.71	0.81	0.91	

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW04S MPT-13-MW04S-01 GW 5/13/2002	MPT-13-MW05S MPT-13-MW05S-01 GW 5/13/2002	MPT-13-MW06S MPT-13-MW06S-01 GW 5/16/2002	MPT-13-MW07S MPT-13-MW07S-01 GW 5/13/2002	MPT-13-MW08S MPT-13-MW08S GW 3/12/2003	MPT-13-MW08S MPT-13-MW08S-01 GW 5/16/2002	MPT-13-MW09S MPT-13-MW09S GW 3/12/2003	MPT-13-MW09S MPT-13-MW09S-01 GW 5/16/2002
Semivolatile Organics (ug/L)								
3&4-METHYLPHENOL			9.6 U					
BIS(2-ETHYLHEXYL)PHTHALATE			9.6 U					
Inorganics (ug/L)								
ANTIMONY	2.1 U	2.1 U		2.1 U		2.1 U		2.1 U
IRON	1190	34.2		73.4	2210	713	2210	2140
MANGANESE	229	94.5		45.6	441	215	211	225
SODIUM	936000	349000		456000		733000		85500
VANADIUM	0.74	0.46 U		1.8		0.87		0.71

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW10S MPT-13-MW10S GW 3/12/2003	MPT-13-MW10S MPT-13-MW10S-01 GW 5/14/2002
Semivolatile Organics (ug/L)		
3&4-METHYLPHENOL		
BIS(2-ETHYLHEXYL)PHTHALATE		
Inorganics (ug/L)		
ANTIMONY		2.1 U
IRON	6500	5820
MANGANESE	156	261
SODIUM		105000
VANADIUM		0.75

SUBSURFACE SOIL

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW04S MPT-13-4 SO 1/24/1992	MPT-13-MW04S MPT-13-4-AVG SO 1/24/1992	MPT-13-MW04S MPT-13-4-D SO 1/24/1992	MPT-13-MW05S MPT-13-5 SO 1/24/1992	MPT-13-MW06S MPT-13-6 SO 1/24/1992
Volatile Organics (ug/kg)					
1,1,1,2-TETRACHLOROETHANE	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
1,1,1-TRICHLOROETHANE	6 U	6 U	6 U	6 U	6 U
1,1,2,2-TETRACHLOROETHANE	6 U	6 U	6 U	6 U	6 U
1,1,2-TRICHLOROETHANE	6 U	6 U	6 U	6 U	6 U
1,1-DICHLOROETHANE	6 U	6 U	6 U	6 U	6 U
1,1-DICHLOROETHENE	6 U	6 U	6 U	6 U	6 U
1,2,3-TRICHLOROPROPANE	6 U	6 U	6 U	6 U	6 U
1,2-DIBROMO-3-CHLOROPROPANE	11 UJ	11 UJ	11 UJ	12 UJ	12 UJ
1,2-DIBROMOETHANE	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
1,2-DICHLOROBENZENE	6 U	6 U	6 U	6 U	6 U
1,2-DICHLOROETHANE	6 U	6 U	6 U	6 U	6 U
1,2-DICHLOROPROPANE	6 U	6 U	6 U	6 U	6 U
1,3-DICHLOROBENZENE	6 U	6 U	6 U	6 U	6 U
1,4-DICHLOROBENZENE	6 U	6 U	6 U	6 U	6 U
1,4-DIOXANE	220 R	220 R	220 R	240 R	250 R
2-BUTANONE	11 U	12 U	13 U	12 U	12 U
2-CHLOROETHYL VINYL ETHER	11 U	11 U	11 U	12 U	12 U
2-HEXANONE	11 U	11 U	11 U	12 U	12 U
3-CHLOROPROPENE	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
4-CHLORO-3-METHYLPHENOL	370 U	370 U	370 U	400 U	400 U
4-METHYL-2-PENTANONE	11 U	11 U	11 U	12 U	12 U
ACETONE	11 U	36.5 U	62 U	34 U	55 U
ACETONITRILE	110 UJ	110 UJ	110 UJ	120 UJ	120 UJ
ACROLEIN	110 U	110 U	110 U	120 U	120 U
ACRYLONITRILE	110 U	110 U	110 U	120 U	120 U
BENZENE	6 U	6 U	6 U	6 U	6 U
BROMODICHLOROMETHANE	6 U	6 U	6 U	6 U	6 U
BROMOFORM	6 U	6 U	6 U	6 U	6 U
BROMOMETHANE	11 U	11 U	11 U	12 U	12 U
CARBON DISULFIDE	6 U	2 J	2 J	6 U	6 U
CARBON TETRACHLORIDE	6 U	6 U	6 U	6 U	6 U
CHLOROBENZENE	6 U	6 U	6 U	6 U	6 U
CHLORODIBROMOMETHANE	6 U	6 U	6 U	6 U	6 U
CHLOROETHANE	11 U	11 U	11 U	12 U	12 U
CHLOROFORM	6 U	6 U	6 U	6 U	6 U
CHLOROMETHANE	11 U	11 U	11 U	12 U	12 U
CHLOROPRENE	220 UJ	220 UJ	220 UJ	250 UJ	250 UJ
CIS-1,3-DICHLOROPROPENE	6 U	6 U	6 U	6 U	6 U
DIBROMOMETHANE	6 U	6 U	6 U	6 U	6 U
ETHYL METHACRYLATE	6 U	6 U	6 U	6 U	6 U
ETHYLBENZENE	6 U	6 U	6 U	6 U	6 U

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW04S MPT-13-4 SO 1/24/1992	MPT-13-MW04S MPT-13-4-AVG SO 1/24/1992	MPT-13-MW04S MPT-13-4-D SO 1/24/1992	MPT-13-MW05S MPT-13-5 SO 1/24/1992	MPT-13-MW06S MPT-13-6 SO 1/24/1992
ISOBUTANOL	220 UJ	220 UJ	220 UJ	250 UJ	250 UJ
METHACRYLONITRILE	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
METHYL IODIDE	11 U	11 U	11 U	12 U	12 U
METHYL METHACRYLATE	11 UJ	11 UJ	11 UJ	12 UJ	12 UJ
METHYLENE CHLORIDE	11 U	10 U	9 U	25 U	42 U
PENTACHLOROETHANE	11 UJ	11 UJ	11 UJ	12 UJ	12 UJ
PROPIONITRILE	110 UJ	110 UJ	110 UJ	120 UJ	120 UJ
STYRENE	6 U	6 U	6 U	6 U	6 U
TETRACHLOROETHENE	6 U	6 U	6 U	6 U	6 U
TOLUENE	6 U	6 U	6 U	6 U	6 U
TOTAL 1,2-DICHLOROETHENE	6 U	6 U	6 U	6 U	6 U
TOTAL XYLENES	5 J	7.5 J	10	3 J	6 U
TRANS-1,3-DICHLOROPROPENE	6 U	6 U	6 U	6 U	6 U
TRANS-1,4-DICHLORO-2-BUTENE	6 U	6 U	6 U	6 U	6 U
TRICHLOROETHENE	6 U	6 U	6 U	6 U	6 U
TRICHLOROFLUOROMETHANE	6 U	6 U	6 U	36 J	6 U
VINYL ACETATE	11 U	11 U	11 U	12 U	12 U
VINYL CHLORIDE	11 U	11 U	11 U	12 U	12 U
Semivolatiles (ug/kg)					
1,2,4,5-TETRACHLOROBENZENE	1800 U	1800 U	1800 U	2000 U	2000 U
1,2,4-TRICHLOROBENZENE	370 U	370 U	370 U	400 U	400 U
1,2-DIPHENYLHYDRAZINE	370 U	370 U	370 U	400 U	400 U
1,3,5-TRINITROBENZENE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
1,3-DINITROBENZENE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
1,4-NAPHTHOQUINONE	1800 UJ	1800 UJ	1800 UJ	2000 UJ	2000 UJ
1,4-PHENYLENEDIAMINE	1800 UJ	1800 UJ	1800 UJ	2000 UJ	2000 UJ
1-NAPHTHYLAMINE	1800 U	1800 U	1800 U	2000 U	2000 U
2,3,4,6-TETRACHLOROPHENOL	370 U	370 U	370 U	400 U	400 U
2,4,5-TRICHLOROPHENOL	1800 U	1800 U	1800 U	2000 U	2000 U
2,4,6-TRICHLOROPHENOL	370 U	370 U	370 U	400 U	400 U
2,4-DICHLOROPHENOL	370 U	370 U	370 U	400 U	400 U
2,4-DIMETHYLPHENOL	370 U	370 U	370 U	400 U	400 U
2,4-DINITROPHENOL	1800 U	1800 U	1800 U	2000 U	2000 U
2,4-DINITROTOLUENE	370 U	370 U	370 U	400 U	400 U
2,6-DICHLOROPHENOL	370 U	370 U	370 U	400 U	400 U
2,6-DINITROTOLUENE	370 U	370 U	370 U	400 U	400 U
2-ACETYLAMINOFLUORENE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
2-CHLORONAPHTHALENE	370 U	370 U	370 U	400 U	400 U
2-CHLOROPHENOL	370 U	370 U	370 U	400 U	400 U
2-METHYLNAPHTHALENE	370 U	370 U	370 U	400 U	400 U
2-METHYLPHENOL	370 U	370 U	370 U	400 U	400 U
2-NAPHTHYLAMINE	1800 U	1800 U	1800 U	2000 U	2000 U

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW04S MPT-13-4 SO 1/24/1992	MPT-13-MW04S MPT-13-4-AVG SO 1/24/1992	MPT-13-MW04S MPT-13-4-D SO 1/24/1992	MPT-13-MW05S MPT-13-5 SO 1/24/1992	MPT-13-MW06S MPT-13-6 SO 1/24/1992
2-NITROANILINE	1800 U	1800 U	1800 U	2000 U	2000 U
2-NITROPHENOL	370 U	370 U	370 U	400 U	400 U
2-PICOLINE	1800 U	1800 U	1800 U	2000 U	2000 U
3,3'-DICHLOROBENZIDINE	740 U	740 U	740 U	800 U	800 U
3,3'-DIMETHYLBENZIDINE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
3-METHYLCHOLANTHRENE	370 U	370 U	370 U	400 U	400 U
3-NITROANILINE	1800 U	1800 U	1800 U	2000 U	2000 U
4,6-DINITRO-2-METHYLPHENOL	1800 U	1800 U	1800 U	2000 U	2000 U
4-AMINOBIPHENYL	1800 U	1800 U	1800 U	2000 U	2000 U
4-BROMOPHENYL PHENYL ETHER	370 U	370 U	370 U	400 U	400 U
4-CHLOROANILINE	370 U	370 U	370 U	400 U	400 U
4-CHLOROPHENYL PHENYL ETHER	370 U	370 U	370 U	400 U	400 U
4-METHYLPHENOL	370 U	370 U	370 U	400 U	400 U
4-NITROANILINE	1800 U	1800 U	1800 U	2000 U	2000 U
4-NITROPHENOL	1800 U	1800 U	1800 U	2000 U	2000 U
4-NITROQUINOLINE-1-OXIDE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
5-NITRO-O-TOLUIDINE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
7,12-DIMETHYLBENZ(A)ANTHRACENE	370 U	370 U	370 U	400 U	400 U
A,A-DIMETHYLPHENETHYLAMINE	1800 R	1800 R	1800 R	2000 R	2000 R
ACENAPHTHENE	370 U	370 U	370 U	400 U	400 U
ACENAPHTHYLENE	370 U	370 U	370 U	400 U	400 U
ACETOPHENONE	370 U	370 U	370 U	400 U	400 U
ANILINE	370 U	370 U	370 U	400 U	400 U
ANTHRACENE	370 U	370 U	370 U	400 U	400 U
BENZIDINE	1800 U	1800 U	1800 U	2000 U	2000 U
BENZO(A)ANTHRACENE	370 U	370 U	370 U	400 U	400 U
BENZO(A)PYRENE	370 U	370 U	370 U	400 U	400 U
BENZO(B)FLUORANTHENE	370 U	370 U	370 U	400 U	400 U
BENZO(G,H,I)PERYLENE	370 U	370 U	370 U	400 U	400 U
BENZO(K)FLUORANTHENE	370 U	370 U	370 U	400 U	400 U
BENZOIC ACID	1800 U	1800 U	1800 U	2000 U	2000 U
BENZYL ALCOHOL	370 U	370 U	370 U	400 U	400 U
BIS(2-CHLOROETHOXY)METHANE	370 U	370 U	370 U	400 U	400 U
BIS(2-CHLOROETHYL)ETHER	370 U	370 U	370 U	400 U	400 U
BIS(2-ETHYLHEXYL)PHTHALATE	370 U	370 U	370 U	400 U	400 U
BUTYL BENZYL PHTHALATE	370 U	370 U	370 U	400 U	400 U
CHRYSENE	370 U	370 U	370 U	400 U	400 U
DI-N-BUTYL PHTHALATE	370 U	370 U	370 U	400 U	400 U
DI-N-OCTYL PHTHALATE	370 U	370 U	370 U	400 U	400 U
DIBENZO(A,H)ANTHRACENE	370 U	370 U	370 U	400 U	400 U
DIBENZOFURAN	370 U	370 U	370 U	400 U	400 U
DIETHYL PHTHALATE	370 U	370 U	370 U	400 U	400 U

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW04S MPT-13-4 SO 1/24/1992	MPT-13-MW04S MPT-13-4-AVG SO 1/24/1992	MPT-13-MW04S MPT-13-4-D SO 1/24/1992	MPT-13-MW05S MPT-13-5 SO 1/24/1992	MPT-13-MW06S MPT-13-6 SO 1/24/1992
DIMETHYL PHTHALATE	370 U	370 U	370 U	400 U	400 U
DIPHENYLAMINE	370 R	370 R	370 R	400 R	400 R
ETHYL METHANE SULFONATE	370 U	370 U	370 U	400 U	400 U
FLUORANTHENE	370 U	370 U	370 U	400 U	400 U
FLUORENE	370 U	370 U	370 U	400 U	400 U
HEXACHLOROBENZENE	370 U	370 U	370 U	400 U	400 U
HEXACHLOROBUTADIENE	370 U	370 U	370 U	400 U	400 U
HEXACHLOROCYCLOPENTADIENE	370 U	370 U	370 U	400 U	400 U
HEXACHLOROETHANE	370 U	370 U	370 U	400 U	400 U
HEXACHLOROPHENE	1800 UJ	1800 UJ	1800 UJ	2000 UJ	2000 UJ
HEXACHLOROPROPENE	1800 UJ	1800 UJ	1800 UJ	2000 UJ	2000 UJ
INDENO(1,2,3-CD)PYRENE	370 U	370 U	370 U	400 U	400 U
ISOPHORONE	370 U	370 U	370 U	400 U	400 U
ISOSAFROLE	1800 UJ	1800 UJ	1800 UJ	2000 UJ	2000 UJ
METHAPYRILENE	1800 UJ	1800 UJ	1800 UJ	2000 UJ	2000 UJ
METHYL METHANE SULFONATE	370 U	370 U	370 U	400 U	400 U
N-NITROSO-DI-N-BUTYLAMINE	370 U	370 U	370 U	400 U	400 U
N-NITROSO-DI-N-PROPYLAMINE	370 U	370 U	370 U	400 U	400 U
N-NITROSODIETHYLAMINE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
N-NITROSODIMETHYLAMINE	370 U	370 U	370 U	400 U	400 U
N-NITROSODIPHENYLAMINE	370 U	370 U	370 U	400 U	400 U
N-NITROSOMETHYLETHYLAMINE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
N-NITROSOMORPHOLINE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
N-NITROSOPIPERIDINE	370 U	370 U	370 U	400 U	400 U
N-NITROSOPYRROLIDINE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
NAPHTHALENE	370 U	370 U	370 U	400 U	400 U
NITROBENZENE	370 U	370 U	370 U	400 U	400 U
O-TOLUIDINE	370 UJ	370 UJ	370 UJ	400 UJ	400 UJ
P-(DIMETHYLAMINO)AZOBENZENE	370 U	370 U	370 U	400 U	400 U
PENTACHLOROBENZENE	1800 U	1800 U	1800 U	2000 U	2000 U
PENTACHLORONITROBENZENE	1800 U	1800 U	1800 U	2000 U	2000 U
PENTACHLOROPHENOL	1800 U	1800 U	1800 U	400 U	1900 U
PHENACETIN	370 U	370 U	370 U	400 U	400 U
PHENANTHRENE	370 U	370 U	370 U	400 U	400 U
PHENOL	370 U	370 U	370 U	400 U	400 U
PRONAMIDE	370 U	370 U	370 U	400 U	400 U
PYRENE	370 U	370 U	370 U	42 J	400 U
PYRIDINE	1800 U	1800 U	1800 U	2000 U	2000 U
SAFROLE	1800 UJ	1800 UJ	1800 UJ	2000 UJ	2000 UJ
Pesticides/PCBs (ug/kg)					
4,4'-DDD	9 U	9 U	9 U	9.8 U	1 U
4,4'-DDE	9 U	9 U	9 U	9.8 U	1 U

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW04S MPT-13-4 SO 1/24/1992	MPT-13-MW04S MPT-13-4-AVG SO 1/24/1992	MPT-13-MW04S MPT-13-4-D SO 1/24/1992	MPT-13-MW05S MPT-13-5 SO 1/24/1992	MPT-13-MW06S MPT-13-6 SO 1/24/1992
4,4'-DDT	9 U	9 U	9 U	9.8 U	1 U
ALDRIN	4.5 U	4.5 U	4.5 U	4.9 U	0.5 U
ALPHA-BHC	4.5 U	4.5 U	4.5 U	4.9 U	0.5 U
AROCLOR-1016	360 U	360 U	360 U	390 U	39 U
AROCLOR-1221	900 U	900 U	900 U	980 U	96 U
AROCLOR-1232	900 U	900 U	900 U	980 U	96 U
AROCLOR-1242	360 U	360 U	360 U	390 U	39 U
AROCLOR-1248	180 U	180 U	180 U	200 U	19 U
AROCLOR-1254	90 U	90 U	90 U	98 U	9.6 U
AROCLOR-1260	90 U	90 U	90 U	98 U	9.6 U
BETA-BHC	9 U	9 U	9 U	9.8 U	1 U
CHLORDANE	350 U	272.5	370	49 U	4.8 U
CHLOROBENZILATE	220 U	220 U	220 U	240 U	24 U
DELTA-BHC	4.5 U	4.5 U	4.5 U	4.9 U	0.5 U
DIALLATE	450 U	450 U	450 U	490 U	48 U
DIELDRIN	9 U	9 U	9 U	9.8 U	1 U
ENDOSULFAN I	9 U	9 U	9 U	9.8 U	1 U
ENDOSULFAN II	9 U	9 U	9 U	9.8 U	1 U
ENDOSULFAN SULFATE	9 U	9 U	9 U	9.8 U	1 U
ENDRIN	9 U	9 U	9 U	9.8 U	1 U
ENDRIN ALDEHYDE	9 U	9 U	9 U	9.8 U	1 U
ENDRIN KETONE	9 U	9 U	9 U	9.8 U	1 U
GAMMA-BHC (LINDANE)	4.5 U	4.5 U	4.5 U	4.9 U	0.5 U
HEPTACHLOR	4.5 U	4.5 U	4.5 U	4.9 U	0.5 U
HEPTACHLOR EPOXIDE	4.5 U	4.5 U	4.5 U	4.9 U	0.5 U
ISODRIN	9 U	9 U	9 U	9.8 U	1 U
METHOXYCHLOR	18 U	18 U	18 U	20 U	1.9 U
TOXAPHENE	230 U	225 U	220 U	240 U	24 U
Inorganics (mg/kg)					
ANTIMONY	8.8 UJ	8.85 UJ	8.9 UJ	9.2 UJ	9.8 J
ARSENIC	0.52 J	0.44 J	0.36 J	0.17 J	0.16 UJ
BARIUM	7.5 J	7.8 J	8.1 J	6.6 J	2.5 J
BERYLLIUM	0.023 UJ	0.023 UJ	0.023 UJ	0.024 UJ	0.024 UJ
CADMIUM	0.36 UJ	0.36 UJ	0.36 UJ	0.37 UJ	0.36 UJ
CHROMIUM	2.8 J	3.15 J	3.5 J	2.1 J	1.8 J
COBALT	1.1 UJ	1.1 UJ	1.1 UJ	1.2 UJ	1.2 UJ
COPPER	2 J	1.95 J	1.9 J	0.41 J	1.7 J
LEAD	2.4 UJ	2 J	2.8 J	1.3 UJ	1.1 UJ
MERCURY	0.078 UJ	0.076 UJ	0.074 UJ	0.076 UJ	0.073 UJ
NICKEL	2.5 J	2.85 J	3.2 J	1.6 UJ	1.6 UJ
SELENIUM	0.28 UJ	0.28 UJ	0.28 UJ	0.3 UJ	0.29 UJ
SILVER	0.51 UJ	0.51 UJ	0.51 UJ	0.53 UJ	0.52 UJ

LOCATION NSAMPLE MATRIX SAMPLE DATE	MPT-13-MW04S MPT-13-4 SO 1/24/1992	MPT-13-MW04S MPT-13-4-AVG SO 1/24/1992	MPT-13-MW04S MPT-13-4-D SO 1/24/1992	MPT-13-MW05S MPT-13-5 SO 1/24/1992	MPT-13-MW06S MPT-13-6 SO 1/24/1992
THALLIUM	0.31 UJ	0.31 UJ	0.31 UJ	0.32 UJ	0.32 UJ
TIN	46 UJ	46.05 UJ	46.1 UJ	47.9 UJ	47 UJ
VANADIUM	2.7 UJ	3.15 UJ	3.6 UJ	1.9 UJ	1.7 UJ
ZINC	19.4 J	14.35 J	18.6 UJ	7.5 UJ	11.6 UJ

SURFACE SOIL

LOCATION	MPT-13-SD01	MPT-13-SD02	MPT-13-SD03
NSAMPLE	MPT-13-SD-1	MPT-13-SD-2	MPT-13-SD-3
MATRIX	SD	SD	SD
SAMPLE DATE	1/23/1992	1/23/1992	1/23/1992
Volatile Organics (ug/kg)			
1,1,1,2-TETRACHLOROETHANE	7 UJ	6 UJ	7 UJ
1,1,1-TRICHLOROETHANE	7 U	6 U	7 U
1,1,2,2-TETRACHLOROETHANE	7 U	6 U	7 U
1,1,2-TRICHLOROETHANE	7 U	6 U	7 U
1,1-DICHLOROETHANE	7 U	6 U	7 U
1,1-DICHLOROETHENE	7 U	6 U	7 U
1,2,3-TRICHLOROPROPANE	7 U	6 U	7 U
1,2-DIBROMO-3-CHLOROPROPANE	14 UJ	13 UJ	14 UJ
1,2-DIBROMOETHANE	7 UJ	6 UJ	7 UJ
1,2-DICHLOROBENZENE	7 U	6 U	7 U
1,2-DICHLOROETHANE	7 U	6 U	7 U
1,2-DICHLOROPROPANE	7 U	6 U	7 U
1,3-DICHLOROBENZENE	7 U	6 U	7 U
1,4-DICHLOROBENZENE	7 U	6 U	7 U
1,4-DIOXANE	290 R	250 R	270 R
2-BUTANONE	14 U	13 U	15 U
2-CHLOROETHYL VINYL ETHER	14 U	13 U	14 U
2-HEXANONE	14 U	13 U	14 U
3-CHLOROPROPENE	7 UJ	6 UJ	7 UJ
4-CHLORO-3-METHYLPHENOL	430 U	420 U	430 U
4-METHYL-2-PENTANONE	14 U	13 U	14 U
ACETONE	14 U	13 U	14 U
ACETONITRILE	140 UJ	130 UJ	140 UJ
ACROLEIN	140 U	130 U	140 U
ACRYLONITRILE	140 U	130 U	140 U
BENZENE	7 U	6 U	7 U
BROMODICHLOROMETHANE	7 U	6 U	7 U
BROMOFORM	7 U	6 U	7 U
BROMOMETHANE	14 U	13 U	14 U
CARBON DISULFIDE	7 U	6 U	7 U
CARBON TETRACHLORIDE	7 U	6 U	7 U
CHLOROBENZENE	7 U	6 U	7 U
CHLORODIBROMOMETHANE	7 U	6 U	7 U
CHLOROETHANE	14 U	13 U	14 U
CHLOROFORM	7 U	6 U	7 U
CHLOROMETHANE	14 U	13 U	14 U
CHLOROPRENE	290 UJ	250 UJ	270 UJ
CIS-1,3-DICHLOROPROPENE	7 U	6 U	7 U
DIBROMOMETHANE	7 U	6 U	7 U
ETHYL METHACRYLATE	7 U	6 U	7 U
ETHYLBENZENE	7 U	6 U	7 U
ISOBUTANOL	290 UJ	250 UJ	270 UJ
METHACRYLONITRILE	7 UJ	6 UJ	7 UJ
METHYL IODIDE	14 U	13 U	14 U
METHYL METHACRYLATE	14 UJ	13 UJ	14 UJ
METHYLENE CHLORIDE	19 U	17 U	26 U
PENTACHLOROETHANE	14 UJ	13 UJ	14 UJ
PROPIONITRILE	140 UJ	130 UJ	140 UJ
STYRENE	7 U	6 U	7 U
TETRACHLOROETHENE	7 U	6 U	7 U

TOLUENE	7 U	6 U	7 U
TOTAL 1,2-DICHLOROETHENE	7 U	6 U	7 U
TOTAL XYLENES	7 U	6 U	7 U
TRANS-1,3-DICHLOROPROPENE	7 U	6 U	7 U
TRANS-1,4-DICHLORO-2-BUTENE	7 U	6 U	7 U
TRICHLOROETHENE	7 U	6 U	7 U
TRICHLOROFLUOROMETHANE	7 U	6 U	7 U
VINYL ACETATE	14 U	13 U	14 U
VINYL CHLORIDE	14 U	13 U	14 U
Semivolatile Organics (ug/kg)			
1,2,4,5-TETRACHLOROBENZENE	2100 U	2100 U	2100 U
1,2,4-TRICHLOROBENZENE	430 U	420 U	430 U
1,2-DIPHENYLHYDRAZINE	430 U	420 U	430 U
1,3,5-TRINITROBENZENE	430 UJ	420 UJ	430 UJ
1,3-DINITROBENZENE	430 UJ	420 UJ	430 UJ
1,4-NAPHTHOQUINONE	2100 UJ	2100 UJ	2100 UJ
1,4-PHENYLENEDIAMINE	2100 UJ	2100 UJ	2100 UJ
1-NAPHTHYLAMINE	2100 U	2100 U	2100 U
2,3,4,6-TETRACHLOROPHENOL	430 U	420 U	430 U
2,4,5-TRICHLOROPHENOL	2100 U	2100 U	2100 U
2,4,6-TRICHLOROPHENOL	430 U	420 U	430 U
2,4-DICHLOROPHENOL	430 U	420 U	430 U
2,4-DIMETHYLPHENOL	430 U	420 U	430 U
2,4-DINITROPHENOL	2100 U	2100 U	2100 U
2,4-DINITROTOLUENE	430 U	420 U	430 U
2,6-DICHLOROPHENOL	430 U	420 U	430 U
2,6-DINITROTOLUENE	430 U	420 U	430 U
2-ACETYLAMINOFLUORENE	430 UJ	420 UJ	430 UJ
2-CHLORONAPHTHALENE	430 U	420 U	430 U
2-CHLOROPHENOL	430 U	420 U	430 U
2-METHYLNAPHTHALENE	430 U	420 U	430 U
2-METHYLPHENOL	430 U	420 U	430 U
2-NAPHTHYLAMINE	2100 U	2100 U	2100 U
2-NITROANILINE	2100 U	2100 U	2100 U
2-NITROPHENOL	430 U	420 U	430 U
2-PICOLINE	2100 U	2100 U	2100 U
3,3'-DICHLOROBENZIDINE	870 U	850 U	860 U
3,3'-DIMETHYLBENZIDINE	430 UJ	420 UJ	430 UJ
3-METHYLCHOLANTHRENE	430 U	420 U	430 U
3-NITROANILINE	2100 U	2100 U	2100 U
4,6-DINITRO-2-METHYLPHENOL	2100 U	2100 U	2100 U
4-AMINOBIPHENYL	2100 U	2100 U	2100 U
4-BROMOPHENYL PHENYL ETHER	430 U	420 U	430 U
4-CHLOROANILINE	430 U	420 U	430 U
4-CHLOROPHENYL PHENYL ETHER	430 U	420 U	430 U
4-METHYLPHENOL	430 U	420 U	430 U
4-NITROANILINE	2100 U	2100 U	2100 U
4-NITROPHENOL	2100 U	2100 U	2100 U
4-NITROQUINOLINE-1-OXIDE	430 UJ	420 UJ	430 UJ
5-NITRO-O-TOLUIDINE	430 UJ	420 UJ	430 UJ
7,12-DIMETHYLBENZ(A)ANTHRACENE	430 U	420 U	430 U
A,A-DIMETHYLPHENETHYLAMINE	2100 U	2100 U	2100 U
ACENAPHTHENE	430 U	420 U	430 U
ACENAPHTHYLENE	430 U	420 U	430 U
ACETOPHENONE	430 U	420 U	430 U

ANILINE	430 U	420 U	430 U
ANTHRACENE	430 U	420 U	430 U
BENZIDINE	2100 U	2100 U	2100 U
BENZO(A)ANTHRACENE	430 U	420 U	430 U
BENZO(A)PYRENE	430 U	420 U	430 U
BENZO(B)FLUORANTHENE	430 U	420 U	430 U
BENZO(G,H,I)PERYLENE	430 U	420 U	430 U
BENZO(K)FLUORANTHENE	430 U	420 U	430 U
BENZOIC ACID	2100 U	2100 U	2100 U
BENZYL ALCOHOL	430 U	420 U	430 U
BIS(2-CHLOROETHOXY)METHANE	430 U	420 U	430 U
BIS(2-CHLOROETHYL)ETHER	430 U	420 U	430 U
BIS(2-ETHYLHEXYL)PHTHALATE	170 J	420 U	45 J
BUTYL BENZYL PHTHALATE	430 U	420 U	430 U
CHRYSENE	59 J	420 U	430 U
DI-N-BUTYL PHTHALATE	430 U	420 U	430 U
DI-N-OCTYL PHTHALATE	430 U	420 U	430 U
DIBENZO(A,H)ANTHRACENE	430 U	420 U	430 U
DIBENZOFURAN	430 U	420 U	430 U
DIETHYL PHTHALATE	430 U	420 U	430 U
DIMETHYL PHTHALATE	430 U	420 U	430 U
DIPHENYLAMINE	430 R	420 R	430 R
ETHYL METHANE SULFONATE	430 U	420 U	430 U
FLUORANTHENE	53 J	420 U	430 U
FLUORENE	430 U	420 U	430 U
HEXACHLOROBENZENE	430 U	420 U	430 U
HEXACHLOROBUTADIENE	430 U	420 U	430 U
HEXACHLOROCYCLOPENTADIENE	430 U	420 U	430 U
HEXACHLOROETHANE	430 U	420 U	430 U
HEXACHLOROPHENE	2100 UJ	2100 UJ	2100 UJ
HEXACHLOROPROPENE	2100 UJ	2100 UJ	2100 UJ
INDENO(1,2,3-CD)PYRENE	430 U	420 U	430 U
ISOPHORONE	430 U	420 U	430 U
ISOSAFROLE	2100 UJ	2100 UJ	2100 UJ
METHAPYRILENE	2100 UJ	2100 UJ	2100 UJ
METHYL METHANE SULFONATE	430 U	420 U	430 U
N-NITROSO-DI-N-BUTYLAMINE	430 U	420 U	430 U
N-NITROSO-DI-N-PROPYLAMINE	430 U	420 U	430 U
N-NITROSODIETHYLAMINE	430 UJ	420 UJ	430 UJ
N-NITROSODIMETHYLAMINE	430 U	420 U	430 U
N-NITROSODIPHENYLAMINE	430 U	420 U	430 U
N-NITROSOMETHYLETHYLAMINE	430 UJ	420 UJ	430 UJ
N-NITROSOMORPHOLINE	430 UJ	420 UJ	430 UJ
N-NITROSOPIPERIDINE	430 R	420 R	430 R
N-NITROSOPYRROLIDINE	430 UJ	420 UJ	430 UJ
NAPHTHALENE	430 U	420 U	430 U
NITROBENZENE	430 U	420 U	430 U
O-TOLUIDINE	430 UJ	420 UJ	430 UJ
P-(DIMETHYLAMINO)AZOBENZENE	430 U	420 U	430 U
PENTACHLOROBENZENE	2100 U	2100 U	2100 U
PENTACHLORONITROBENZENE	2100 U	2100 U	2100 U
PENTACHLOROPHENOL	2100 U	2100 U	2100 U
PHENACETIN	430 U	420 U	430 U
PHENANTHRENE	430 U	420 U	430 U
PHENOL	430 U	420 U	430 U

PRONAMIDE	430 U	420 U	430 U
PYRENE	51 J	420 U	430 U
PYRIDINE	2100 U	2100 U	2100 U
SAFROLE	2100 UJ	2100 UJ	2100 UJ
Pesticides/PCBs (ug/kg)			
4,4'-DDD	1.1 U	1.3 U	4.1 J
4,4'-DDE	1.2	1.3 U	2.4 J
4,4'-DDT	1.1 U	1.3 U	1.1 U
ALDRIN	0.5 U	0.5 U	0.5 U
ALPHA-BHC	0.5 U	0.5 U	0.5 U
AROCLOR-1016	42 U	41 U	42 U
AROCLOR-1221	110 U	100 U	110 U
AROCLOR-1232	110 U	100 U	110 U
AROCLOR-1242	42 U	41 U	42 U
AROCLOR-1248	21 U	21 U	21 U
AROCLOR-1254	11 U	10 U	11 U
AROCLOR-1260	11 U	10 U	11 U
BETA-BHC	1.1 U	1.3 U	1.1 U
CHLORDANE	9.4	5.1 U	11 U
CHLOROBENZILATE	26 U	26 U	26 U
DELTA-BHC	0.5 U	0.5 U	0.5 U
DIALLATE	53 U	51 U	53 U
DIELDRIN	1.1 U	1.3 U	1.1 U
ENDOSULFAN I	1.1 U	1.3 U	1.1 U
ENDOSULFAN II	1.1 U	1.3 U	1.1 U
ENDOSULFAN SULFATE	1.1 U	1.3 U	1.1 U
ENDRIN	1.1 U	1.3 U	1.1 U
ENDRIN ALDEHYDE	1.1 U	1.3 U	1.1 U
ENDRIN KETONE	1.1 U	1.3 U	1.1 U
GAMMA-BHC (LINDANE)	0.5 U	0.5 U	0.5 U
HEPTACHLOR	0.5 U	0.5 U	0.5 U
HEPTACHLOR EPOXIDE	0.5 U	0.5 U	0.5 U
ISODRIN	1.1 U	1 U	1.1 U
METHOXYCHLOR	2.2 U	2.6 U	2.1 U
TOXAPHENE	26 U	26 U	226 U
Inorganics (mg/kg)			
ANTIMONY	11.7 UJ	11.1 UJ	10.5 UJ
ARSENIC	0.42 J	0.33 J	0.69 J
BARIUM	4.1 J	1.8 J	5.2 J
BERYLLIUM	0.031 UJ	0.029 UJ	0.027 UJ
CADMIUM	1.1 UJ	0.45 UJ	0.66 UJ
CHROMIUM	3.3 J	1.7 J	3.7 J
COBALT	2.5 J	1.4 UJ	1.7 J
COPPER	4.1 J	0.43 J	5.4 J
LEAD	5.3 J	0.97 UJ	7.5 J
MERCURY	0.058 UJ	0.092 UJ	0.076 UJ
NICKEL	2 UJ	1.9 UJ	1.8 UJ
SELENIUM	0.38 UJ	0.36 UJ	0.34 UJ
SILVER	0.68 UJ	0.64 UJ	0.6 UJ
THALLIUM	0.41 UJ	0.39 UJ	0.37 UJ
TIN	60.9 UJ	58 UJ	54.5 UJ
VANADIUM	3.1 J	1 J	3.7 J
ZINC	37.6 J	4.6 J	17.2 J

APPENDIX C

95 PERCENT UCL CALCULATIONS

General Statistics

Data File		Variable: TPH	
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	15	Shapiro-Wilk Test Statisitic	0.429512
Number of Unique Samples	3	Shapiro-Wilk 5% Critical Value	0.881
Minimum	200	Data not normal at 5% significance level	
Maximum	449		
Mean	227.8	95% UCL (Assuming Normal Distribution)	
Median	200	Student	261.8821
Standard Deviation	74.94398		
Variance	5616.6	Gamma Distribution Test	
Coefficient of Variation	0.32899	A-D Test Statistic	4.447853
Skewness	2.604056	A-D 5% Critical Value	0.736239
		K-S Test Statistic	0.518697
Gamma Statistics		K-S 5% Critical Value	0.221375
k hat	14.21515	Data do not follow gamma distribution	
k star (bias corrected)	11.41656	at 5% significance level	
Theta hat	16.02516		
Theta star	19.95347	95% UCLs (Assuming Gamma Distribution)	
nu hat	426.4544	Approximate Gamma UCL	259.5457
nu star	342.4968	Adjusted Gamma UCL	263.7851
Approx.Chi Square Value (.05)	300.6052		
Adjusted Level of Significance	0.03235	Lognormal Distribution Test	
Adjusted Chi Square Value	295.774	Shapiro-Wilk Test Statisitic	0.428419
		Shapiro-Wilk 5% Critical Value	0.881
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	5.298317		
Maximum of log data	6.107023	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.392882	95% H-UCL	257.0351
Standard Deviation of log data	0.252372	95% Chebyshev (MVUE) UCL	291.3023
Variance of log data	0.063692	97.5% Chebyshev (MVUE) UCL	319.3614
		99% Chebyshev (MVUE) UCL	374.4781
		95% Non-parametric UCLs	
		CLT UCL	259.6287
		Adj-CLT UCL (Adjusted for skewness)	273.5306
		Mod-t U	264.0506
		Jackknife UCL	261.8821
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
RECOMMENDATION		Hall's Bootstrap UCL	N/R
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
Use Student's-t UCL		95% Chebyshev (Mean, Sd) UCL	312.1467
or Modified-t UCL		97.5% Chebyshev (Mean, Sd) UCL	348.6435
		99% Chebyshev (Mean, Sd) UCL	420.3346